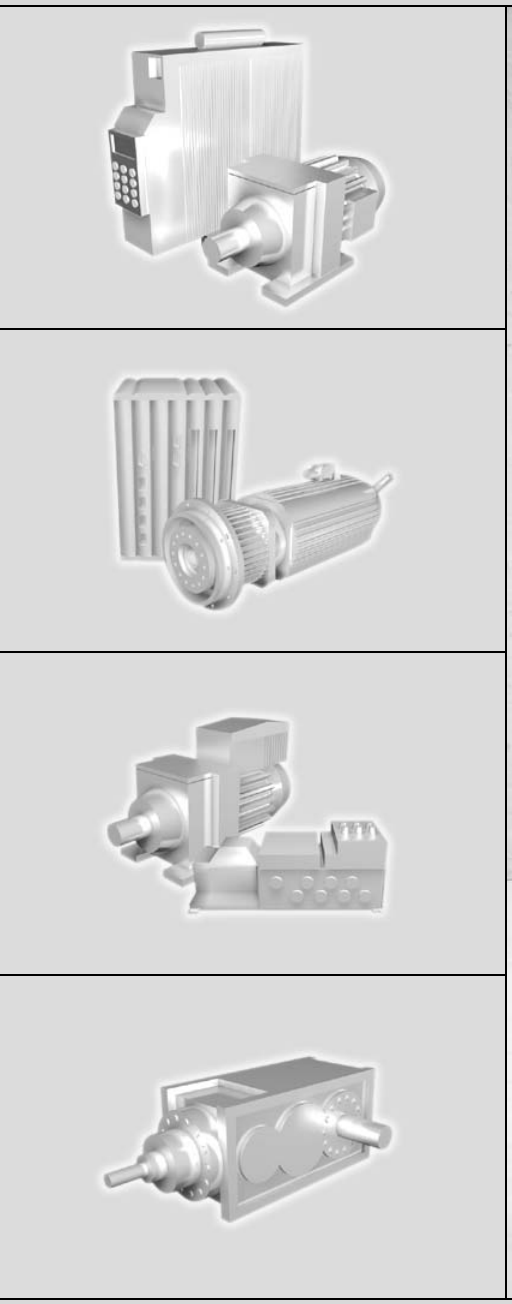
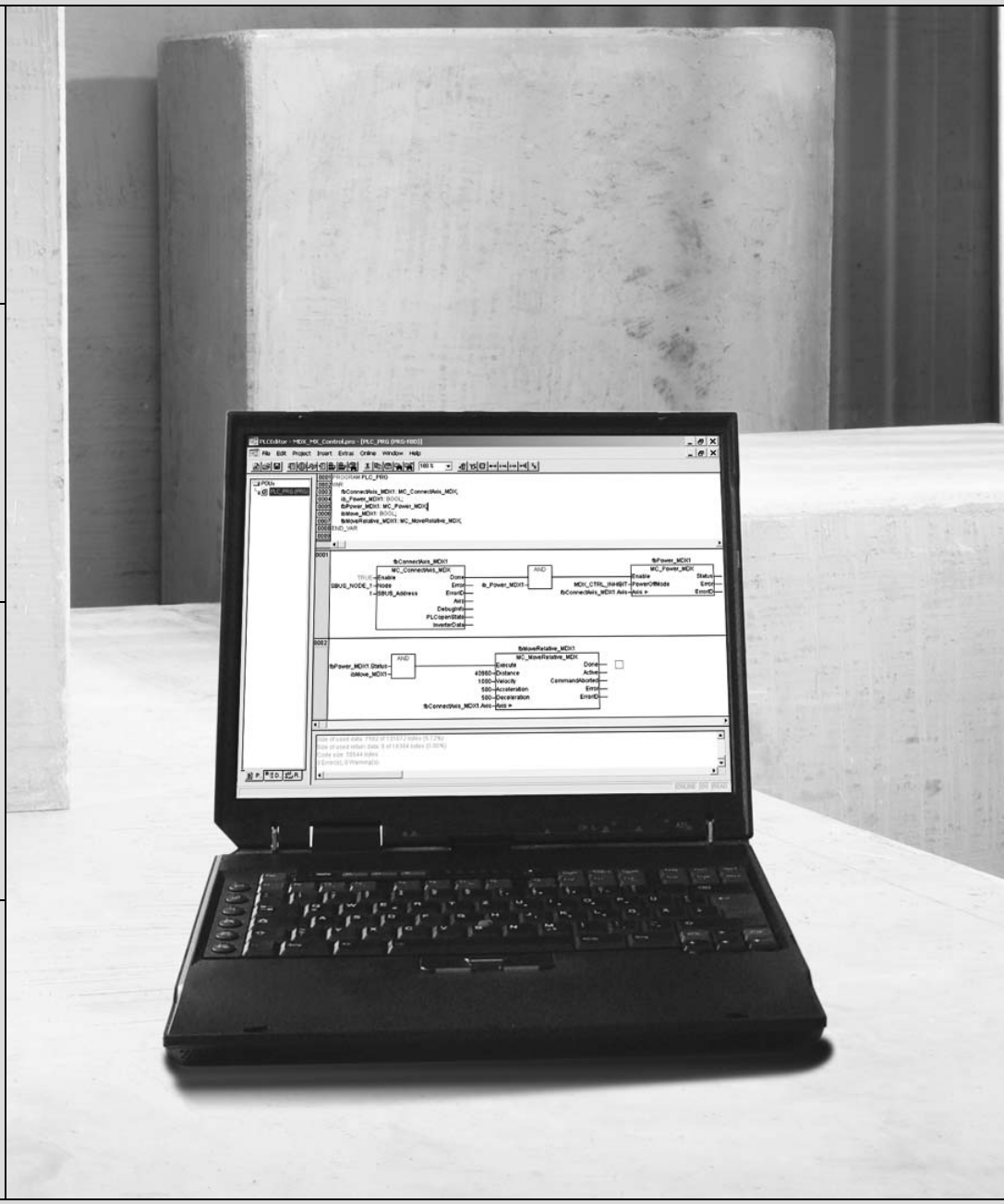
SEW EURODRIVE





MPLCMotion_MDX and MPLCMotion_MX Libraries for MOVI-PLC®

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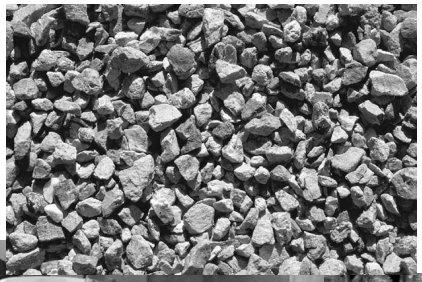
Manual



SEW EURODRIVE

1 Important Notes 5

2 Introduction 7
2.1 Areas of application 8
2.2 Overview of the MPLCMotion_MDX/MX libraries 9
2.3 Overview of additional libraries for the MOVI-PLC® control 11

3 Project Planning and Startup 12
3.1 Prerequisites 12
3.2 Communication times 14
3.3 MOVIDRIVE® B startup 15
3.4 MOVIAXIS® startup 19
3.5 MOVIDRIVE® B units and ranges of values 20
3.6 MOVIAXIS® units and ranges of values 21

4 Description of the Function Modules 22
4.1 General behavior of the function modules 22
4.2 State diagram 27
4.3 MDX/MX_Config directory 29
4.3.1 Function module MC_InitialConfig_MDX/MX 29
4.3.2 Function module MC_SetSync_MDX/MX 32
4.4 MDX/MX_InverterParameters directory 34
4.4.1 Function module MC_GetDataprofile4Data_MDX 34
4.4.2 Function module MC_ReadParameter_MDX/MX 36
4.4.3 Function module MC_WriteParameter_MDX/MX 38
4.4.4 Function module MC_SetDynamics_MDX/MX 40
4.4.5 Function module MC_SetEncoderType_MDX/MX 42
4.4.6 Function module MC_SetJerk_MDX/MX 44
4.4.7 Function module MC_SetLimiter_MDX/MX 46
4.4.8 Function module MC_SetHomeParameters_MDX/MX 49
4.4.9 Function module MC_SetModuloParameters_MDX/MX 51
4.5 MDX/MX_Main directory 53
4.5.1 Function module MC_ConnectAxis_MDX/MX 53
4.5.2 Function module MC_ConnectAxisSimulation_MDX/MX 59
4.5.3 Function module MC_Power_MDX/MX 62
4.5.4 Function module MC_QuickEnable_MDX/MX 64
4.5.5 Function module MC_Reset_MDX/MX 66
4.6 MDX/MX_SingleAxis directory 67
4.6.1 Function module MC_MoveVelocity_MDX/MX 67
4.6.2 Function module MC_MoveAbsolute_MDX/MX 69
4.6.3 Function module MC_MoveAbsoluteModulo_MDX 71
4.6.4 Function module MC_MoveRelative_MDX/MX 74
4.6.5 Function module MC_MoveRelativeModulo_MDX 76
4.6.6 Function module MC_MoveModulo_MX 78
4.6.7 Function module MC_Home_MDX/MX 80
4.6.8 Function module MC_AxisStop_MDX/MX and MC_Stop_MDX/MX . 82
4.7 MDX_SingleAxisSensorless directory 84
4.7.1 Function module MC_MoveVelocitySensorless_MDX 84
4.7.2 Function module MC_AxisStopSensorless_MDX and MC_StopSensorless_MDX 86
4.8 MDX/MX_SingleAxisSEW directory 89
4.8.1 Function module MC_MoveTergetSpeed_MDX/MX 89
4.8.2 Function module MC_MoveTargetPosition_MDX/MX 92
4.8.3 Function module MC_HomeEnable_MDX/MX 95
4.8.4 Function module MC_MoveTargetSpeedSensorless_MDX 97

4.9 MDX/MX_Supplements directory 100
4.9.1 Function module MC_TouchProbe.._MDX/MX 100
4.9.2 Function module MC_GetInverterInfos_MDX/MX 103
4.9.3 Function module MC_ReadActualPosition_MDX 105
4.9.4 Function module MC_ReadAxisError_MDX 106
4.9.5 Function module MC_ReadStatus_MDX 107
4.10 Error ID 109

5 Programming Examples 111
5.1 Prerequisites 111
5.2 Positioning a motor axis 112
5.3 Speed control of a motor axis with encoder 124
5.4 Jog mode of a motor axis without encoder 129

6 Appendix 134
6.1 Overview of the transferred MOVIDRIVE® / MOVIAXIS® actual values 134
6.2 CAN identifier 135
6.3 MOVIDRIVE® B system variables 137

7 Index 138

1 Important Notes

- **This manual does not replace the detailed operating instructions.**
- **The MOVI-PLC® control and the drives it controls may only be installed and started up by trained personnel observing the applicable accident prevention regulations, the MOVI-PLC® control manual and the MOVIDRIVE® MDX60B/61B or MOVIAXIS® MX operating instructions.**

Documentation

- Read through this manual carefully before you start to install and startup inverters or servo inverter controlled by the MOVI-PLC® control.
- This manual assumes that the user has access to and is familiar with the MOVIDRIVE® and MOVIAXIS® documentation, in particular the MOVIDRIVE® MDX60B/61B system manual and the MOVIAXIS® system folder.
- In this manual, cross references are marked with "→". For example, (→ section X.X) means: Further information can be found in section X.X of this manual.
- As a prerequisite to fault-free operation and fulfillment of warranty claims, you must adhere to the information in the documentation.

Bus systems

General safety notes for bus systems:

This communication system allows you to adjust the MOVI-PLC® control, the MOVIDRIVE® inverter and the MOVIAXIS® servo inverter to your specific application very accurately. As with all bus systems, there is a danger of invisible, external (as far as the unit is concerned) modifications to the settings, which give rise to changes in the unit behavior. This may result in unexpected (not uncontrolled, though) system behavior when considering this unit.

Explanation of the safety and warning notes

Observe the safety and warning notes contained in this documentation!

Electrical hazard
Possible consequences: Severe or fatal injuries

Hazard
Possible consequences: Severe or fatal injuries

Hazardous situation
Possible consequences: Slight or minor injuries

Harmful situation
Possible consequences: Damage to the unit and the environment.

Tips and useful information

2 Introduction

Content of the manual

This user manual describes the function modules of the MPLCMotion_MDX and MPLCMotion_MX libraries as well as their application.

Description

MOVI-PLC® is a programmable logic control designed in accordance with IEC 61131-3. One feature of the MOVI-PLC® control is, for example, the DHP11B control card.

You can use the MOVI-PLC® control, for example, as the control unit of a machine module. In this way, MOVI-PLC® controls all the drives within the machine module and in doing so takes off load from the machine control (e.g. machine or system PLC). In conjunction with a DOP operator terminal and CANopen IOs, MOVI-PLC® can also be used as a control for entire machines.

The MPLCMotion_MDX and MPLCMotion_MX libraries of the MOVI-PLC® control described in this manual allow you to program the axis movements of connected MOVIDRIVE® MDX60B/61B / MOVIAXIS drives simply and centrally.

The control of the MOVITRAC® 07 / B, MOVIMOT® frequency inverter and the integrated frequency inverter in the MOVIFIT® FC is described in the "MPLCMotion_MC07 and MPLCMotion_MM libraries for MOVI-PLC®".

For further information about the MPLCProcessdata, refer to the system manual "MOVI-PLC® programming in the PLC Editor".

Functions

The MPLCMotion_MDX and MPLCMotion_MX libraries provide the following functions for each connected MOVIDRIVE® MDX60B/61B or MOVIAXIS® drive:

- Administrative functions
- Inverter operation (speed specification)
- Reference travel
- Positioning
- etc.

These functions are executed decentrally in the inverters and servo inverters. The MPLCMotion_MDX and MPLCMotion_MX libraries ensure fast communication with the inverters and servo inverters and allow you to program the motor axis movements simply and centrally in the MOVI-PLC® control.

Additional documentation

For simple and effective use of the MPLCMotion_MDX and MPLCMotion_MX libraries, you should also order the following documentation:

- System manual "MOVI-PLC® programming in PLC editor"
- "MOVI-PLC® basic DHP11B control" manual.
- "MOVIDRIVE® MDX60B/61B" system manual
- "MOVIAXIS®" system folder

You must follow the instructions and safety notes published in these manuals when working with the drive system.

2.1 Areas of application

The MPLCMotion_MDX and MPLCMotion_MX libraries are suitable for all applications in which the MOVI-PLC® controls one or more inverters centrally.

Application examples

Typical application examples of the MPLCMotion_MDX and MPLCMotion_MX libraries:

- Machine modules
- Small machines
- System modules
- Storage and retrieval systems
- Hoist stations
- ...

Features

The MPLCMotion_MDX and MPLCMotion_MX libraries have the following characteristics:

- The MOVI-PLC*basic* DHP11B control can control up to 12 drives with the aid of the MPLCMotion_MDX and MPLCMotion_MX libraries. The MOVI-PLC *advanced* control can control up to 64 drives.
- Users do not have to work with communication interfaces. Instead, they can operate the MOVI-PLC control using only motion and administration commands. Users do not have to be familiar with system bus communication and only require basic knowledge of the parameter settings of the inverter or servo inverters (e.g. for startup or setting the system bus address).
- The system bus enables fast communication between the MOVI-PLC® control and the inverters / servo inverters.
- The MPLCMotion_MDX and MPLCMotion_MX libraries contain numerous function modules. Users can use these modules to program their own applications quickly and flexibly.
- PLCopen-compliant commands allow users to familiarize themselves with the program quickly and easily.

2.2 Overview of the MPLCMotion_MDX/MX libraries

Required libraries

Install the `MPLCMotion_MDX` and `MPLCMotion_MX` libraries in the library manager of the PLC editor of the MOVITOOLS® MotionStudio software (→ section "Programming examples").

As a result, the following listed libraries required for the design of components of the `MPLCMotion_MDX` and `MPLCMotion_MX` libraries are automatically installed in the library manager and for setting the target system (→ "Programming examples" section).

- `MPLCDatatypes`
- `MPLCInterface_CAN`
- `MPLCInterface_COM`
- `MPLCInterface_MoviLink`
- `MPLCSystem_ErrorCodes`
- `MPLCSystem_MathFunctions`
- `MPLCSystem_"MOVI-PLC-Typ"`

  (e.g. MPLCSystem_DHP11B, according to target system setting)

The `MPLCMotion_MDX` and `MPLCMotion_MX` `libraries` contain the following function modules, which are divided into several directories according to their function:

MDX/MX_Config

`MDX/MX_Config` directory:

- MC_InitialConfig_MDX/MX
- MC_SetSync_MDX/MX

MDX/MX_Inverter Parameters

`MDX/MX_InverterParameters` directory:

- MC_GetDataprofile4Data_MDX
- MC_ReadParameter_MDX/MX
- MC_WriteParameter_MDX/MX
- MC_SetDynamics_MDX/MX
- MC_SetEncoderType_MDX/MX
- MC_SetJerk_MDX/MX
- MC_SetLimiter_MDX/MX
- MC_SetHomeParameters_MDX/MX
- MC_SetModuloParameters_MDX/MX

MDX/MX_Main

`MDX/MX_Main` directory:

- MC_ConnectAxis_MDX/MX
- MC_ConnectAxisSimulation_MDX/MX
- MC_Power_MDX/MX
- MC_QuickEnable_MDX/MX
- MC_Reset_MDX/MX

MDX/MX_Single Axis

`MDX/MX_SingleAxis` directory:

- MC_Home_MDX/MX
- MC_AxisStop_MDX/MX
- MC_Stop_MDX/MX

- Continuous motion function module:
  - MC_MoveVelocity_MDX/MX

- Discrete motion function modules:
  - MC_MoveAbsolute_MDX/MX
  - MC_MoveAbsoluteModulo_MDX
  - MC_MoveRelative_MDX/MX
  - MC_MoveRelativeModulo_MDX
  - MC_MoveModulo_MX

MDX_SingleAxis Sensorless

`MDX_SingleAxisSensorless` directory:

- MC_StopSensorless_MDX
- MC_AxisStopSensorless_MDX

- Continuous motion function module:
  - MC_MoveVelocitySensorless_MDX

The `MC_SingleAxisSensorless` directory only exists in the `MPLCMotion_MDX` library.

MDX/MX_Single AxisSEW

`MDX/MX_SingleAxisSEW` directory:

- MC_HomeEnable_MDX/MX

- Continuous motion function modules:
  - MC_MoveTargetSpeed_MDX/MX
  - MC_MoveTargetSpeedSensorless_MDX
- Discrete motion function modules:
  - MC_MoveTargetPosition_MDX/MX
  - MC_MoveTargetPositionModulo_MDX/MX

The MC_MoveTargetSpeedSensorless function module only exists in the `MPLCMotion_MDX` library.

MDX/MX_Supplements

`MDX_Supplements` directory:

- MC_TouchProbe1_MDX/MX
- MC_TouchProbe2_MDX/MX
- MC_GetInverterInfos_MDX/MX
- MC_ReadActualPosition_MDX
- MC_ReadAxisError_MDX
- MC_ReadStatus_MDX

Note:

You can use the `MPLCMotion_MDX` und `MPLCMotion_MX` libraries with all the other libraries for the MOVI-PLC® control at the same time.

However, fault-free operation can only be ensured when you operate all inverters and servo inverters, which are controlled using the function modules of the `MPLCMotion_MDX` and `MPLCMotion_MX` libraries, on one or more system CAN buses on which no other manually configured CAN objects (e.g. SCOM Transmit/Receive) are set up.

2.3 Overview of additional libraries for the MOVI-PLC® control

In addition to the MPLCMotion_MDX and MPLCMotion_MX libraries, you can install a number of additional libraries in the PLC editor of the MOVITOOLS® MotionStudio software to optimize the control of the drive and frequency inverters provided by SEW-EURODRIVE as well as other periphery modules.

The following is an overview of the basic libraries available for controlling units connected to the MOVI-PLC® control. In addition to these libraries, further application-specific libraries are available, e.g. for handling, cams, synchronous operation, winder applications, etc. depending on the inverter type.

MPLCProcessdata	**MPLCMotion_MDX**	**MPLCMotion_MC07**	**MPLCMotion_MX**	**MPLCMotion_MM**	**MPLCUtilities**
MOVI-PLC® can be used as a conventional control • Controls all SEW inverters via process data • For using process data profiles, application modules or your own IPOS® programs	MOVI-PLC® as motion control for MOVIDRIVE® B • Single-axis motion commands • Use of MOVIDRIVE® B interfaces	MOVI-PLC® as motion control for MOVITRAC® 07 MOVITRAC® B MOVIFIT® • Speed commands • Use of MOVITRAC® 07 MOVITRAC® B MOVIFIT® FC interfaces	MOVI-PLC® as motion control for MOVIAXIS® • Single-axis motion commands • Use of MOVIAXIS® interfaces	MOVI-PLC® as motion control for MOVIMOT® • Speed commands • Use of MOVIMOT® interfaces	For example, connection with CANopen I/O modules
↓	↓	↓	↓	↓	↓
SEW process data modules	MOVIDRIVE® B	MOVITRAC® 07 MOVITRAC® B MOVIFIT® FC	MOVIAXIS®	MOVIMOT®	CANopen I/O modules
Elements that have to be installed in the control configuration of the PLC editor to be able to use the libraries					
Overview of the inverter / unit-specific motion libraries and input / output libraries					

3 Project Planning and Startup

This section describes the prerequisites for using the MPLCMotion_MDX and MPLCMotion_MX libraries and contains important information for project planning and startup.

3.1 Prerequisites

PC and software

An engineering PC and the MOVITOOLS® MotionStudio software are both required to program the MOVI-PLC® control using the MPLCMotion_MDX and MPLCMotion_MX libraries. For more information on the PC and software requirements, refer to the "MOVI-PLC® programming in PLC editor" system manual.

MOVI-PLC®

The firmware version of the MOVI-PLC® and the version of the Motion library must be identical. Both versions can be displayed using the "Information & remote control" tool (open using the context menu of "MOVI-PLC®" in the MOVITOOLS® MotionStudio software). Load the appropriate versions of firmware and Motion library using the "Version management" tool (open using the context menu of "MOVI-PLC®" in the MOVITOOLS® MotionStudio software).

For fault-free operation, all function modules (except MC_QuickEnable_MDX/MX function module) of the MPLCMotion_MDX and MPLCMotion_MX libraries must each be executed in the same task of the MOVI-PLC® (→ "MOVI-PLC® programming in PLC editor" system manual).

MOVIDRIVE® B

- The MOVI-PLC® control can only be used to control the MOVIDRIVE® MDX60B/61B inverter from MOVIDRIVE® firmware version 824 854 0.16.
- If the MOVI-PLC® control is installed in the MOVIDRIVE® MDX61B, at least firmware version 824 854 0.16 is required even when this MOVIDRIVE® MDX61B is not controlled by the MOVI-PLC® control.
- The standard version of MOVIDRIVE® MDX60B/61B is sufficient to use the continuous motion function modules (→ section. 2.2) and function modules that position the motor axis (discrete motion function modules, MC_Home_MDX, MC_HomeEnable_MDX).

MOVIAXIS®

The MOVI-PLC® control can only be used to control the MOVIAXIS® servo inverter from MOVIAXIS® firmware version 1820 880 0.20.

Control topology

You can connect up to 64 of the following inverters to the MOVI-PLC® control via the system CAN buses (up to 12 with MOVI-PLC® *basic*):

- MOVIDRIVE® MDX60B/61B
- MOVIAXIS®
- MOVITRAC® 07 / B
- MOVIMOT® (fieldbus interface CANopen MFO... required)
- Inverters controlled via the `MPLCProcessdata` library (e.g. MOVIDRIVE® A)

Note the following prerequisites for MOVI-PLC® *basic* DHP11B..:

- Connect a maximum of six inverters to one system CAN bus.
  - When connecting up to three inverters to one system CAN bus: Set the baud rate of the system CAN bus to 500 kbit/s.
  - When connecting four to six inverters to one system CAN bus: Set the baud rate of the system CAN bus to 1000 kBit/s (when the fastest possible data transfer rate is required).

Important:

The technical characteristics given in this section only apply when no other CAN bus stations are active on the system CAN bus used to control the inverters / servo inverters.

Do not connect any other CAN bus stations to the system CAN bus on which inverters are controlled by the libraries listed in "Overview of additional libraries for the MOVI-PLC® control".

3.2 Communication times

All MOVIDRIVE® MDX60B/61B / MOVIAXIS® units connected to the MOVI-PLC® control send their current actual values to the MOVI-PLC® control. The cycle time for the transfer of the actual values is dependent on the data profile that is set in the control configuration for the module parameters of the inverter / servo inverter. Note the update times of the actual values of MOVIDRIVE® MDX60B/61B and MOVIAXIS® during project planning.

For a detailed description of the data profiles and the corresponding communication times, refer to the appendix (→ section 6.1).

MOVIDRIVE® B - SSI encoder

Using an SSI encoder slows access to all the parameters by a factor of five. Therefore, you should avoid using an SSI encoder for MOVIDRIVE® B and use a Hiperface® encoder instead.

These characteristics affect the response time of the MOVI-PLC® control in conjunction with the inverters. Take these characteristics into account during project planning.

3.3 MOVIDRIVE® B startup

This section describes the startup of the MOVIDRIVE® B inverter. The startup process must be performed when the drive inverter is to be controlled by the MOVI-PLC® control.

Warning:

Only start up the inverter using the startup assistant described in this section.

The following actions must only be performed by trained personnel for initial startup, restart or optimization.

- Manual changes to inverter parameters
- A direct startup for the inverter using the motor startup assistant

Manual changes could lead to unforeseeable operating states that could cause severe or fatal injuries to personnel.

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To access the startup assistant [DriveStartup for MOVI-PLC], open the context menu for the entry [MDX...] in the unit tree of the MOVITOOLS® MotionStudio software.

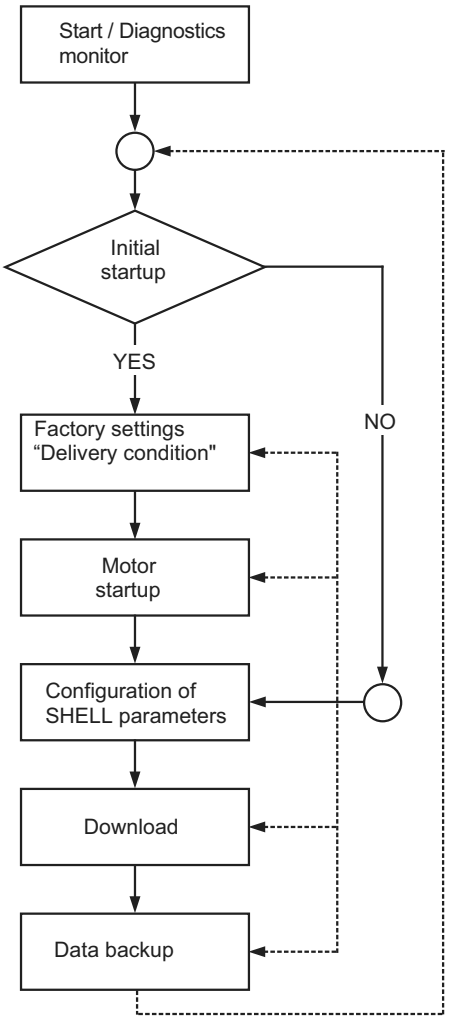
The startup assistant guides you step-by-step through the startup procedure:

1. Load the delivery status
2. Start up the inverter
3. Configure the Shell parameters
4. Download the input values
5. Save the inverter data

The startup assistant detects automatically whether you want to perform initial startup or a restart.

For the initial startup process, you must perform all five steps one after the other.

The startup assistant goes directly to step three for a restart. However, you can start with step one or two for a restart by clicking on the entries manually. This procedure allows you to use the startup assistant to optimize the data, for example for motor startup, at a later date.



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Only perform startup using the startup assistant. Proceed as follows:

Step one

Load the factory settings

The delivery status is loaded.
When the delivery status is loaded:
- Startup data is reset
- All Shell parameters are reset to the default values
- All IPOS$^{plus®}$ variables are deleted
- Any IPOS$^{plus®}$ program code is deleted

↓

Step two

Startup the drive inverter

Follow the instructions of the startup assistant. For details on motor startup, refer to the MOVIDRIVE® MDX60B/61B system manual.

Note:
In the operating mode groups V/f and VFC, you can execute function modules of the `MDX_SingleAxisSensorless` directory. One of the following operating mode groups has to be set for function modules in the `MDX_SingleAxis` directory:
- VFC n-control
- CFC control
- SERVO control

Within an operating mode group, the MOVI-PLC® control sets the operating mode required for the continuous or discrete motion function modules automatically (see also the detailed description on page page 26).

↓

Step three

Configuration of the Shell parameters

Follow the instructions of the startup assistant. You can either accept the default values by clicking [Apply proposal] or change the values as required.

Notes:
1. The SBus address set here must match the SBus address used at the MC_ConnectAxis_MDX function module and the address set in the control configuration of the PLC editor (module parameter of the entry MOVIDRIVE® MDX B). The set baud rate must match the baud rate set in the control configuration of the PLC editor (module parameter of the entry CAN 1/2, default value 500 kBaud).
2. The MOVI-PLC® control can read and use the binary inputs of the drive inverter basic unit or its option in the control program independent of the parameter settings in the groups *P60x* or *P61x*. To prevent the binary inputs from executing additional functions, the corresponding parameters must be set to *IPOS Input* or *No Function*.
   To use the binary outputs of the drive inverter basic unit or its option in the control program of the MOVI-PLC® control, the corresponding parameters in the groups *P62x* or *P63x* have to be set to *IPOS Output*. If these parameters are not set to *IPOS Output*, the binary outputs will be written in the program, but the physical output signals will not be changed. The difference between the output variables and the physical output signal is shown in the control program.
   Some of these parameters are already set to the correct value on delivery.

↓

Step four

Download the input values

You can use this function to load the relevant SHELL user data into the drive inverter.

↓

Step five

Save the inverter data

A complete set of the inverter data is saved in the file [*.vd0].

Important:

- During and after startup, parameters in MOVIDRIVE® B that are changed without using the startup assistant "DriveStartup for MOVI-PLC" must only be performed by trained personnel.
- Parameter changes made by a restart with the startup assistant "DriveStartup for MOVI-PLC" using the function module MC_WriteParameter_MDX or in the Shell of the MOVIDRIVE® B are not automatically recorded in the MOVI-PLC® control program. They can lead to unforeseeable operating states. The new parameters set in the inverter are used in the control program after a reset and a restart of MOVI-PLC®.
- Special parameters that cannot be set using the startup assistant "DriveStartup for MOVI-PLC" must only be changed by trained personnel. Note that changing some parameters can lead to unforeseeable operating states.

IPOS® drive inverter

If you control the drive system using the `MPLCMotion_MDX.lib` library, users cannot program the IPOS$^{plus®}$ software in the connected inverters themselves.

3.4 MOVIAXIS® startup

Startup of the MOVIAXIS® servo inverter is described in the "MOVIAXIS® MX multi-axis servo inverter" operating instructions.

- Ensure the unit is in the delivery state at the beginning of the startup procedure.

  To do this, set the *P9727.3 Delivery status d1* parameter to the value "1". If the parameters set in the motor startup are not reset to the default values, you can also set the *P9727.4 Factory setting d2* parameter to the value "1".

- The transmission rate set at the power supply module (switch S1 to S4) and the basic address for the system bus (MOVIAXIS® signal bus) must correspond with the module parameters set in the control configuration. The basic address corresponds to the SBus address of the axis module directly to the right of the power supply module.

  The axis modules to the right are automatically assigned increasing addresses that must be set correspondingly in the control configuration for the control of the motor axes ("MOVI-PLC® programming in the PLC editor" system manual).

Please read the following warning notes:

- No manual settings are required in the PDO editor for using the function modules from the MPLCMotion_MX library. Function module MC_ConnectAxis_MX configures all the required settings automatically. The following settings that are described may be made in the PDO editor for the use of special functions.
- The control word 0 of the MOVIAXIS® servo inverter is used by the MOVI-PLC® control and must not be changed. The control word 1 of the MOVIAXIS® servo inverter is connected by the function module MC_ConnectAxis_MX with the binary inputs. The default setting of the bits of the control word 1 is "No function". In this setting, the binary inputs of the MOVIAXIS® can be freely used in the program of the MOVI-PLC® control without additional functions. They appear in the control configuration of the MOVI-PLC® control. In addition, you can assign the individual bits of control word 1 in the parameter tree or in the PDO editor with special functions (e.g. CW limit switch).
- Important reference parameters are set using the function module MC_SetHomeParameters_MX. You can set additional reference parameters in the parameter tree (FCB12) or using the function module MC_WriteParameter_MX (→ section "Function module MC_SetHomeParameters_MX").
- In addition, ongoing activities must only be performed by trained personnel as manual changes can lead to unforeseeable operating states that can cause death or serious injury to personnel.

3.5 MOVIDRIVE® B units and ranges of values

Units

The function modules of the `MPLCMotion_MDX` library use the following units for their input and output signals:

- Positions in increments [incr] (4096 increments correspond to a 360° rotation of the motor axis)
- Modulo positioning in modulo increments [incr] (2^{16} modulo increments correspond to a motor axis rotation of 360). The number of complete rotations is specified in the high word and the target angle between 0° and 360° in the low word.
- Speeds in revolutions / minute [rpm]
- Accelerations as ramp times in milliseconds to achieve a speed [ms] changed by 3000 rpm.

  The *Acceleration* input signal specifies the acceleration for increasing the kinetic energy in the motor. The *Deceleration* input signal specifies the braking deceleration for reducing the kinetic energy.
- Jerk as time in milliseconds for the duration of the torque build-up [ms]

Ranges of values

For the function modules of the `MPLCMotion_MDX` library, the following maximum ranges of values are permitted:

- Positions: $-(2^{31})$ ... 2^{31} [incr]
- The maximum setting range of modulo positioning is dependent on the modulo numerator, denominator and encoder resolution: 0 ... 2^{31} / (numerator encoder resolution) [incr].
- Speeds for positioning tasks: 0 ... 6000 [rpm]
- Speeds for speed-controlled travel tasks: -6000 ... 6000 [rpm]
- Accelerations for positioning tasks: 10 ... 20000 [ms]
- Accelerations for speed-controlled travel tasks: 0 ... 2000000 [ms]
- Jerk (not used for speed-controlled travel tasks): 5 ... 2000 [ms]

If the values are outside of these ranges, the function modules will output error messages (except the function modules in the MDX/MX_SingleAxisSEW and MC_SetJerk_MDX/MX directory).

The drive inverter adjusts the travel tasks to these limit values automatically depending on the motor connected and the limit values set in the inverter parameters (e.g. *P302 Maximum speed*). These limit values can be lower than the maximum values that can be set in the function modules. In this case, the function modules do not output error messages. As a result, lag errors can occur during positioning tasks.

3.6 MOVIAXIS® units and ranges of values

Units

The user-defined units for the following sizes can be set as required for the MOVIAXIS® servo inverter (→ "MOVIAXIS® MX multi-axis servo inverter"):

- Travel distance
- Velocity
- Acceleration
- Torque

The input and output signals of the function modules of the `MPLCMotion_MX` library correspond to the set user-defined units.

Ranges of values

The maximum permitted ranges of values for the function modules of the `MPLCMotion_MX` library depend on the set user-defined units (→ "MOVIAXIS® MX multi-axis servo inverter" operating instructions).

MOVIAXIS® adjusts the travel tasks to these limit values automatically depending on the motor connected and the limit values set in the servo inverter parameters.

4 Description of the Function Modules

This section describes the functions and behavior of the function modules of the `MPLCMotion_MDX` and `MPLCMotion_MX` libraries.

4.1 General behavior of the function modules

This section describes the basic functionality of the inputs and outputs of the function modules and other general features of the MOVI-PLC® control and the inverters. For specific examples of the interaction and sequence of several function modules, including time diagrams, refer to section 5, "Programming examples".

There are two types of function modules. They are divided into two activation types.

- Function modules that are activated by the input signal *Enable*.
- Function modules that are activated by the input signal *Execute*.

Input signal Enable

Function modules that are activated by the input signal *Enable* typically perform cyclical actions (e.g. MC_ReadActualPosition_MDX).

- When the input signal *Enable = TRUE*,
  - The function module is active.
  - The function module recalculates the output signals in each cycle.
- When the input signal *Enable = FALSE*,
  - The function module does not recalculate the output signals.
  - All the output signals remain at the value that was last calculated. (Exception: *Done, Busy* and *Error* are reset to *FALSE*.)

Therefore, you must verify the value of the output signals by setting the output signal *Done = TRUE.*

The *Enable* input of the function module MC_ConnectAxis_MDX/MX and MC_ConnectAxisSimulation_MDX/MX differs from the behavior described here. For details, please refer to the description of this function module.

Input signal Execute

Function modules that are activated by the input signal *Execute* typically perform an action once (e.g. MC_ReadParameter_MDX/MX).

A positive edge change at the *Execute* input starts the action.

The output signals remain in effect until the input signal *Execute* is reset to *FALSE* (falling edge) or the function module is cancelled. However, if the input signal *Execute* is reset to FALSE before the action is completed, the output signals remain in effect for at least one more control cycle after the action has been concluded.

If a rising edge occurs at the *Execute* input, the values of the input signals are adopted for the action. Changing the input signals during the action has no effect. Another rising edge signal is required at the *Execute* input to adopt the modified values.

Output signal Done/InVelocity

The function module sets the output signal *Done* or *InVelocity* to *TRUE* once the action of the function module has been executed successfully.

Some function modules maps the conditions *In Position* (discrete motion tasks) or *Speed reached* (continuous motion tasks) of the drive inverter to the output signal *Done*. These function modules check these conditions until a falling edge occurs at the *Execute* input or the function module is cancelled.

As long as the input signal *Execute* is set to *TRUE*, the function module resets the output signal *Done* to *FALSE* when the condition *In Position* or *Speed reached* is no longer fulfilled. The output signal *Done* is set to *TRUE* when the condition is fulfilled again. Consequently, when the input signal *Execute* is set to *TRUE*, the output signal *Done* can change between *TRUE* and *FALSE* several times.

Output signal Active

The output signal *Active* only exists for function modules that control a movement of the motor axis.

The function module sets the output signal *Active* to *TRUE* when the motor axis controlled by the function module turns to reach its target (target position and target speed).

The function module usually sets the output signal *Active* to *TRUE* shortly after a rising edge occurs at the input *Execute*.

If the motor axis is prevented from rotating due to the terminal assignment at the inverter (e.g. controller inhibit or no output stage enable), the function module is executed, but the output signal *Active* is reset to *FALSE*.

The function module sets the output signal *Active* to *TRUE*, when

- The terminal assignment on the drive inverter enables the motor axis to turn when the function module is executed
- The motor axis moves until it reaches the target

The function module resets the output signal *Active* to *FALSE* when one of the output signals *Done,InVelocity*, *Error* or *CommandAborted* is set to *TRUE*.

Output signal Busy

The output signal *Busy* only exists for function modules that require several control cycles for execution and that do not control any movements of the motor axis.

The function module sets the output signal *Busy* to *TRUE* as long as the function module is executed.

The function module resets the output signal *Busy* to *FALSE* when one of the output signals *Done* or *Error* is set to *TRUE*.

Output signal Command Aborted

The output signal *CommandAborted* only exists for function modules that control a movement of the motor axis.

The function module sets the output signal *CommandAborted* to *TRUE*, when its execution is cancelled

- by another function module or
- by another instance of the same function module

when both control the same motor axis.

Otherwise, the active function module is cancelled for:

- DC 24 V operation
- Inverter errors
- Communication errors

This means that the cancelled task of the function module is no longer executed afterwards.

When the cancelled function module sets the output signal *CommandAborted* to *TRUE*, it resets the output signals *Done* or *InVelocity* and *Active* to *FALSE*. The function module resets the output signal *CommandAborted* to *FALSE* by setting a falling edge at the input signal *Execute*.

Motion function modules (continuous / discrete motion function modules and the function modules MC_Home_MDX/MX, MC_HomeEnable_MDX/MX) can cancel the following function modules:

- MC_Stop_MDX/MX, MC_AxisStop_MDX/MX, MC_StopSensorless_MDX
- MC_ConnectAxis_MDX/MX (when the MOVI-PLC® control detects an inverter error, communication error or 24 V operation of the inverter in this function module).
- MC_Power_MDX/MX for *Enable* = *FALSE* (only when MC_Home_MDX/MX, MC_HomeEnable_MDX/MX and PowerOffMode = MDX_CTRL_INHIBIT are executed)
- Discrete motion function modules of the MPLCMotion_MDX library can only cancel discrete motion function modules.
- Continuous motion function modules of the MPLCMotion_MDX library can only cancel continuous motion function modules. Exception: The function modules MC_MoveVelocitySensorless_MDX and MC_MoveTargetSpeedSensorless_MDX can also cancel braking movements triggered by the function modules MC_AxisStopSensorless_MDX and MC_StopSensorless_MDX.
- Continuous motion and discrete motion function modules of the MPLCMotion_MX library can cancel each other.

The function module resets the output signal *Done* to *FALSE* on cancellation, even if the goal of the function module has already been achieved and the specified position or speed window of the cancelled function module is still maintained.

Output signal Error

If an error occurs in the MOVI-PLC control during the execution of a function module, the function module sets the output signal *Error* to *TRUE*. In this case, the respective error is displayed at the output signal *ErrorID*.

Errors in the inverter / servo inverter do not cause the output signal *Error* to be set, but are detected in the MC_ConnectAxis_MDX/MX function module and cause the cancellation of the motion function module.

Response to controller inhibit, no enable, safe stop, CW stop, CCW stop or hold control.

When one or more of the following conditions apply, the function module that is currently active interrupts the active travel task (*DISCRETE_MOTION, CONTINUOUS_MOTION, HOMING*) of the motor axis:

- *Controller inhibit (terminal or MC_Power_MDX/MX)*
- *No enable* (*terminal or MC_Power_MDX*/MX)
- *Safe stop (terminal)*
- *CW stop (terminal)*
- *CCW Stop (terminal)*
- *Hold control (terminal)*

However, the function module does not cancel the travel task. The target position previously set and the setpoint speed are retained.

When the active travel task is interrupted, the function module

- Resets the output signal *Active* to *FALSE*
- Does not set the output signal *CommandAborted* to *TRUE*

The interruption does **not** lead to an error at the function module.

As soon as the stated conditions no longer apply, the function module continues the interrupted travel task.

The motion function module is interrupted from the start if the stated conditions are present at the **start of the actual execution**. It is executed when the conditions that led to the interruption are no longer present.

If the action of a motion function module is to be cancelled **in the interrupted state** and no additional motion command is to be directly connected, one of the function modules MC_Stop_MDX/MX, MC_AxisStop_MDX/MX or MC_StopSensorless_MDX/MX must be executed. This can also occur when the axis is in the "controller inhibit", "no enable", "safe stop" or "hold control" state.

The electrical rotating field is immediately switched off when **setting the controller inhibit or safe stop**. At the same time, the motor brake is applied (independent of the activation of the brake function in the drive parameters) so that the drive is decelerated mechanically. Accordingly, drives without motor brakes are free running and coast to a halt or can be accelerated by external forces.

The drive is decelerated electronically when the **enable is revoked or when the CW / CCW stop or hold control is activated**. Axes without encoders under 15 rpm show a very small maximum torque so that braking to standstill without applying the brake is only possible with small external forces. For an existing motor brake and activated braking function (P730 for MOVIDRIVE® B; index 8584.0 brake function and index 9833.1 brake type not the same, "no brake", for MOVIAXIS®), the motor brake is applied after the brake process for MOVIDRIVE® B shortly before reaching standstill and when the motor standstill is detected for MOVIAXIS®. Accordingly, drives without motor brakes or with a deactivated brake function are free running after the electronic brake application and can be accelerated by external forces.

If a motor axis that was in position control mode once positioning had been completed at the time of the interruption and is moved out of its position by free-running and external forces, the axis returns to the last controlled target position after the interruption.

When a braking movement triggered by one of the function modules MC_Stop_MDX/MX, MC_AxisStop_MDX/MX, MC_StopSensorless_MDX or MC_AxisStopSensorless_MDX is interrupted by one of the executed conditions and the axis is not yet at a standstill at the end of the interruption, then the brake operation is continued after the interruption.

Exception:

The **reference travel** triggered by the function module MC_HomeMDX/MX or MC_HomeEnable_MDX/MX is cancelled by setting the controller inhibit. At the same time, the function module MC_Home_MDX/MX or MC_HomeEnable_MDX/MX sets the output signal *CommandAborted* to *TRUE*.

The reference travel is only interrupted when the enable, CW / CCW stop, hold control or triggering of the safety stop enable is revoked. After the interruption, the motor continues the reference travel.

Behavior in 24 V operation

When 24-V operation is activated, the function module that currently controls the movement of the motor axis cancels the travel task. The function module sets the output signal *CommandAborted* to *TRUE*. As soon as the axis is at a standstill, the *STANDSTILL* state is reached (output signal *PLCopenState* of the function module MC_ConnectAxis_MDX, Section "State diagram") .

Changing discrete-motion / continuous motion for MOVIDRIVE® B

The MOVIDRIVE® inverter implements motion function blocks of the type *CONTINUOUS_MOTION* in one of the following operating modes:

- VFC+n control
- CFC control
- SERVO control

The MOVIDRIVE® B implements motion function blocks of the type *DISCRETE_MOTION* in one of the following operating modes:

- VFC+n control + IPOS® positioning
- CFC control + IPOS® positioning
- SERVO control + IPOS® positioning

The MOVIDRIVE® B does not allow an on-the-fly changeover (that is, without a controller inhibit) in all operating modes. However, standard behavior for all operating modes is required.

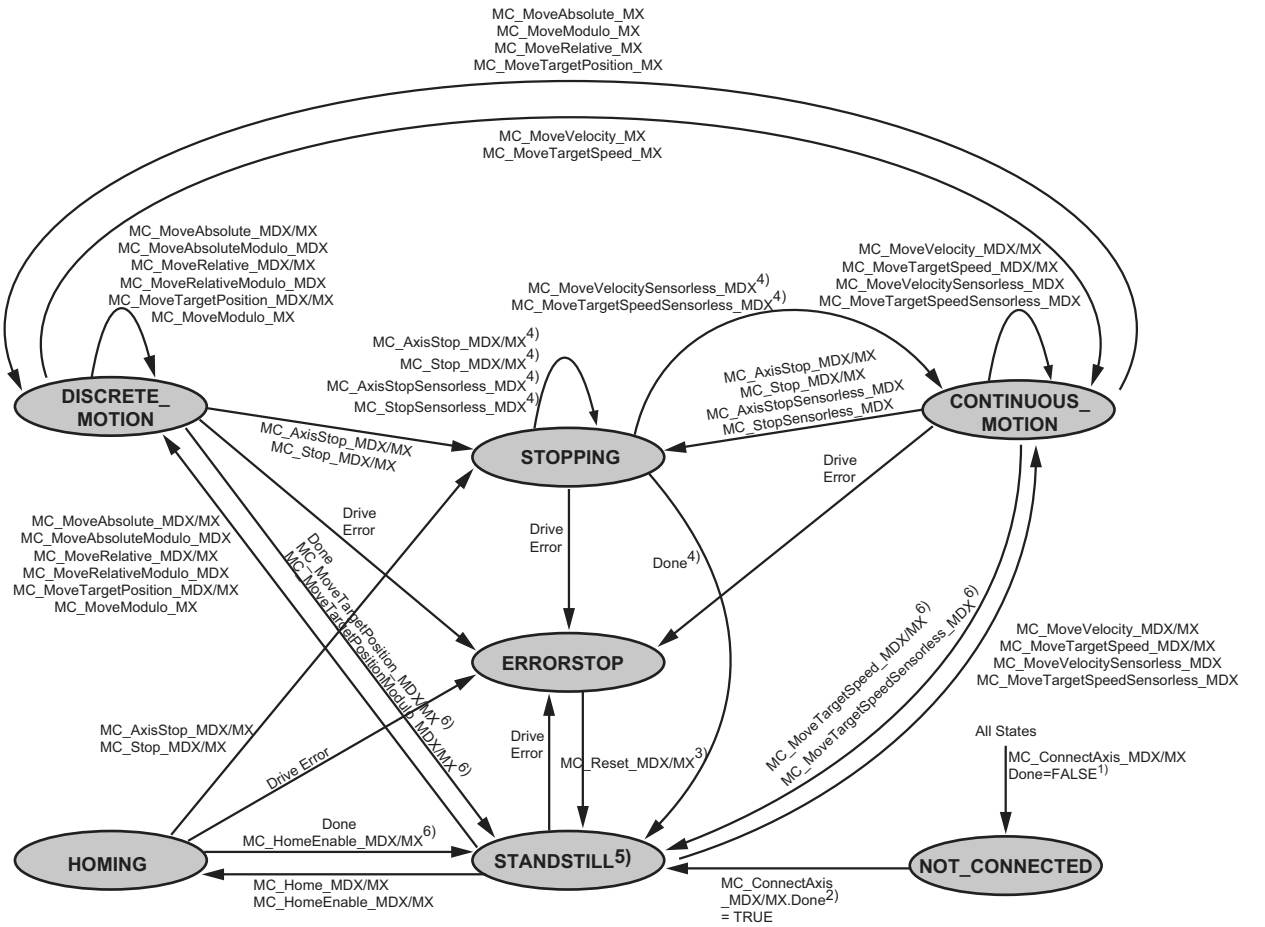
Therefore, changeover is not possible when the motor axis is rotating. In this case, the respective error message is output at the function module.

Changing discrete-motion / continuous motion for MOVIAXIS®

The `MPLCMotion_MX` library supports the switch between *DISCRETE_MOTION* and *CONTINUOUS_MOTION* function modules.

4.2 State diagram

In accordance with the execution of the function modules of the MPLCMotion_MDX/MX libraries, the MOVI-PLC® control is always in a defined state with reference to a motor axis. The current state can be read at any time at the output signal *PLCopenState* of the function module MC_ConnectAxis_MDX/MX or at the output signals of the function module MC_ReadStatus_MDX. The following diagram shows which function modules can be executed in the various states and the state transitions that they cause.



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1. MC_ConnectAxis_MDX/MX.*Done = FALSE* when there is a communication error between the MOVI-PLC® control and the inverter / servo inverter.
2. MC_ConnectAxis_MDX/MX must be called in each control cycle and, therefore, in each state.
3. MC_Reset_MDX/MX can be called in each state, but it only has an effect in the state *ERRORSTOP*. The *NOT_CONNECTED* state is briefly run during the reset phase of the inverter / servo inverter. If a stop module is active during the reset phase (input signal *Execute = TRUE*), the MOVI-PLC® changes to the *STOPPING* state.
4. Prerequisite: The input signal *Execute* of the currently active stop module must be *FALSE*.

5. The *STANDSTILL* state is adopted when the minimum speed (15 rpm) is not reached or the target position window is reached. Possible acceleration caused by external forces must not lead to changes to the *PLCopenState.* If a stop module is activated (rising edge of the input signal *Execute)* in the *STANDSTILL* state, the MOVI-PLC® control changes to the *STOPPING* state.

   The *STANDSTILL* state is also adopted for **MOVIDRIVE® B** directly after the reset procedure when a limit switch error has occurred although the motor axis still attempts to clear the limit switch.

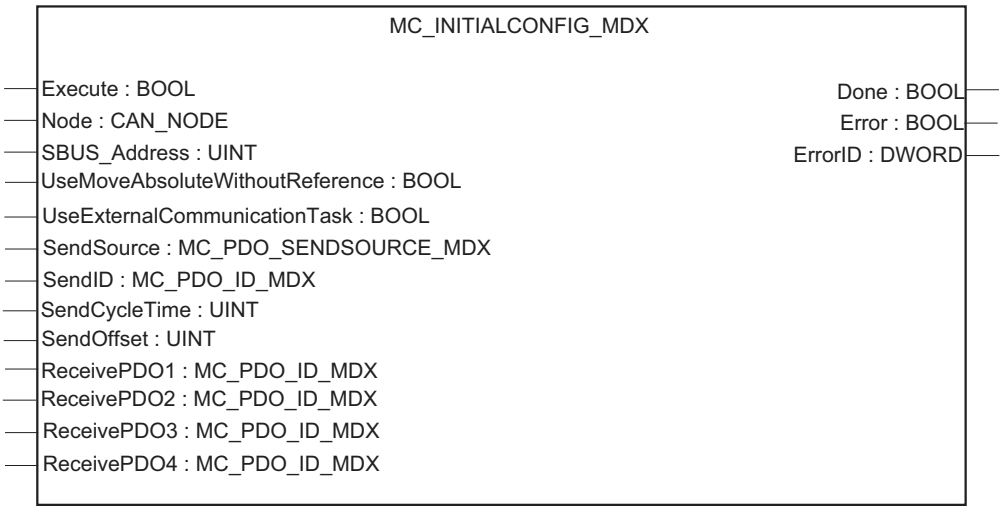
   In this case, there is no automatic clearing movement for **MOVIAXIS®**. A separate travel task is required in order to move clear.

6. The falling edge of the input signal Enable and function module is not cancelled.

4.3 MDX/MX_Config directory

The MDX/MX_Config directory covers function modules that enable the configuration of special functions for controlling a MOVIDRIVE® B / MOVIAXIS®. The function modules in this directory are not required for performing motion tasks without using these special functions.

4.3.1 Function module MC_InitialConfig_MDX/MX



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Application You can use the function module MC_InitialConfig_MDX/MX on all motor axes.

Prerequisites The function module MC_ConnectAxis_MDX/MX or MC_ConnextAxisSimulation_MDX/MX , in reference to the same motor axis, must not yet have been executed when executing the function module MC_InitialConfig_MDX/MX.

Description Special communication features and functions of the inverter / servo inverter can be activated using the function module MC_InitialConfig_MDX/MX. Execution of the function module MC_InitialConfig_MDX/MX is not required for using the function modules from the MPLCMotion_MDX/MX library.

Notes:

- You must execute the function module MC_InitialConfig_MDX/MX only once for each motor axis.
- The inputs *SendSource* to *ReceivePDO4* are only available for function module MC_InitialConfig_MDX for MOVIDRIVE® B.

If the function module MC_InitialConfig_MDX is executed with the input signal *UseMoveAbsoluteWithoutReference = TRUE,* unexpected movements of the drive can occur when positioning for unreferenced axes.

Input signals

The behavior of the function module MC_InitialConfig_MDX/MX is dependent on the following input signals:

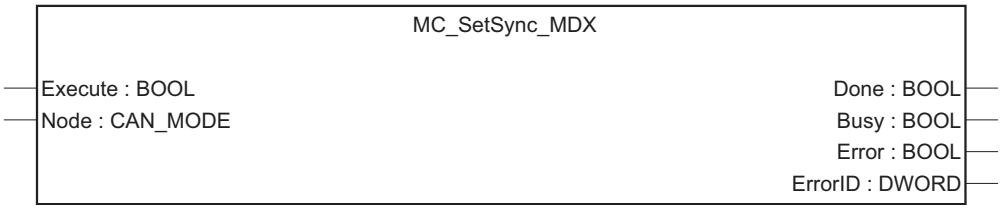
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* starts the task of the function module. If a rising edge occurs at the input signal, the other input signals of the function module are adopted.
Node	CAN_NODE	The input signal *Node* is used to specify the CAN bus node of the MOVI-PLC® that is connected to the inverter / servo inverter to which the configuration settings refer. • SBUS_NODE_1: CAN 1 (connector X33 for DHxx1B; X26 for compact control) • SBUS_NODE_2: CAN 2 (connector X32 for DHxx1B)
SBUS_Address	UINT	The input signal *SBUS_Address* is used to specify the system bus address of the inverter to which the configuration settings refer.
UseMoveAbsoluteWithoutReference	BOOL	If this input signal is set to *TRUE*,, the function modules MC_MoveAbsolute_MDX and MC_MoveAbsoluteModulo_MDX are executed without the drive inverter being referenced. **Important:** Unexpected drive movements can occur for unreferenced axes. The input signal *UseMoveAbsoluteWithoutReference* is not used for MOVIAXIS®.
UseExternalCommunicationTask	BOOL	The communication between the inverter / servo inverter and MOVI-PLC® is initialized and executed as standard via the function module MC_ConnectAxis_MDX/MX. To do this, assign the input signal *UseExternalCommunicationTask* to *FALSE*. If the input signal UseExternalCommunicationTask is set to *TRUE*, the inverter communication does not occur via the function module MC_ConnectAxis_MDX/MX but via a function module in an external task (reserved function).
SendSource (Only for MOVIDRIVE B)	MC_PDO_SENDSOURCE_MDX	An additional inverter send object can be created on the system bus independent of the data profile set in the system configuration via the input signal *SendSource*. The function is reserved for use in conjunction with the technology libraries (e.g. MPLCTecGearMotion_MDX/MX) that can read up to four receive objects (input signals *ReceivePDO*..). If the input is not assigned or is assigned with the value MDX_SEND_OFF, no additional send object is created. Otherwise the input signals *SendID*, *SendCycleTime* and *SendOffset* are evaluated for the parameter settings of the send object. The following process values of the MOVIDRIVE® B can be sent via the additional send object for the corresponding assignment of the input signal via the system bus: • MDX_SEND_OFF (default) → No send object • MDX_SEND_X15 → Actual position X15 motor encoder • MDX_SEND_X14 → Actual position X14 external encoder • MDX_SEND_SSI → Actual position X62 SSI encoder
SendID (Only for MOVIDRIVE B)	MC_PDO_ID_MDX	ID of the MOVIDRIVE B-send object (Default value 129, all values in MC_PDO_ID_MDX are possible)
SendCycleTime (Only for MOVIDRIVE B)	UINT	Cycle time of the MOVIDRIVE® B send object in ms (default value 1)
SendOffset (Only for MOVIDRIVE B)	UINT	Offset of the MOVIDRIVE® B send object in ms (default value 0)
ReceivePDO1	MC_PDO_ID_MDX	Only available for MOVIDRIVE B. ID of the respective receive object. This must correspond with the ID of the required send object (input signal SendID of the instance of MC_InitialConfig_MDX that refers to the transmitting inverter / servo inverter).
ReceivePDO2	MC_PDO_ID_MDX	
ReceivePDO3	MC_PDO_ID_MDX	
ReceivePDO4	MC_PDO_ID_MDX	

Output signals

The function module MC_InitialConfig_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the function module was correctly executed. You can use the output signal *Done* directly as the input signal *Enable* for the function module MC_ConnectAxis_MDX/MX of the same motor axis. • *TRUE*: The function module MC_Initial was correctly executed. • *FALSE:* The function module MC_Initial was incorrectly executed or not executed at all.
Error	BOOL	The output signal *Error* shows whether an error occurred. • *TRUE*: An error has occurred during the execution of the function module. • *FALSE:* No error has occurred.
*Error*ID	DWORD	The output signal *ErrorID* displays the error code of the occurring error (→ see Section "Error Identifier").

4.3.2 Function module MC_SetSync_MDX/MX



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Application

You can only use the function module MC_SetSync_MDX/MX on the CAN lines connected to the MOVI-PLC®.

Prerequisites

SEW-EURODRIVE recommends creating just one synchronization object for each CAN line. There must only be one synchronization object with a specific CAN ID on a CAN line.

Description

The function module MC_SetSync_MDX/MX sets a synchronization object on the CAN nodes of the MOVI-PLC® specified at the input signal *Node* with the following parameters:

- CycleTime = 5 ms
- ID = 128
- OffsetTime = 2ms

To prevent multiple creation of synchronization objects when repeatedly executing the function module MC_SetSync_MDX/MX in relation to the same CAN line (input signal *Node*), the output signal *Error* is set to *TRUE.* Ensure that no other station on the CAN bus sets a synchronization object with the same CAN ID.

Input signals

The behavior of the function module MC_SetSync_MDX/MX is dependent on the following input signals:

Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* starts the task of the function module. When a rising edge occurs at this input signal, the synchronization object is set up.
Node	CAN-NODE	CAN nodes on which the synchronization object should be set up. • SBUS_NODE_1: CAN 1 (connector X33 for DHP11B; X26 for compact control) • SBUS_NODE_2: CAN 2 (connector X32 for DHP11B)

Output signals

The function module MC_SetSync_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the synchronization object was correctly set up.
Busy	BOOL	The output signal *Busy* shows that the synchronization object was set up. • *TRUE*: The synchronization object is currently being set up. • *FALSE:* The synchronization object is currently not being set up.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error occurred while setting up the synchronization object. • *FALSE:* No error has occurred.
ErrorID	DWORD	The output signal *ErrorID* displays the error code of the error that occurred (→ see Section "Error identifier").

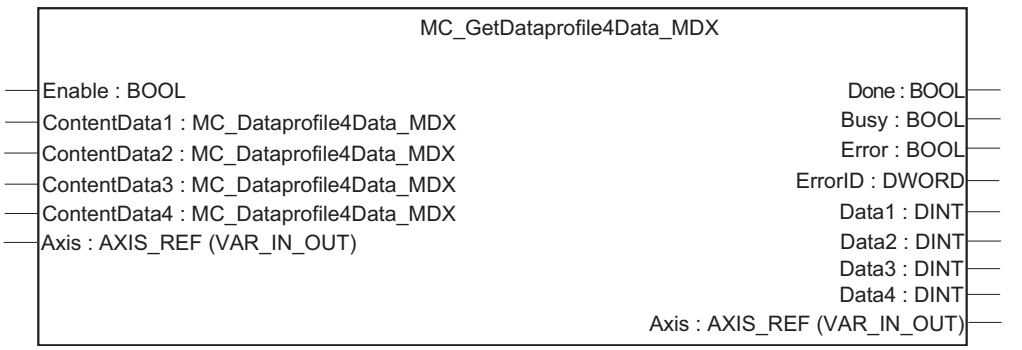
Note:

For example, the synchronization object is required when using synchronous operation or the electronic cam.

4.4 MDX/MX_InverterParameters directory

The `MDX/MX_InverterParameters` directory contains function modules required to write and read parameters of the MOVIDRIVE® inverter.

4.4.1 Function module MC_GetDataprofile4Data_MDX



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Application You can use the function module MC_GetDataprofile4Data_MDX on all motor axes.

Prerequisites The data profile number 4 must be set in the module parameters of the MOVIDRIVE® B in the control configuration so that the function module can be executed (→ Appendix "Overview of MOVIDRIVE® B / MOVIAXIS® actual values transferred".

Description The setpoint speed, actual speed and current motor position of the selected encoder at the MOVIDRIVE® B are transferred to the MOVI-PLC® for the set data profile 4 and are available at the output signal *InverterData* of the function module MC_ConnectAxis_MDX.

You can also select four MOVIDRIVE® B actual values for the set data profile 4 using the function module MC_GetDataprofile4Data_MDX that are cyclically transferred to the MOVI-PLC®. These four actual values are available at the output signals *Data1* to *Data4*.

Input signals

The behavior of the function module MC_GetDataprofile4Data_MDX is dependent on the following input signals.

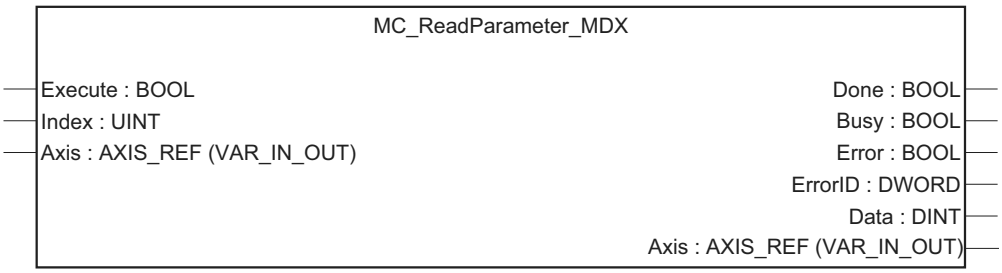
Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module MC_GetDataprofile4Data_MDX/MX. The function module is only executed when the input signal *Enable* is set to *TRUE*. The values of other input signals of the function module are only read when a rising edge occurs at the input signal *Enable*. The actual values (output signals *Data1* to *Data4*) are only transferred when the input signal *Enable* remains set to *TRUE*.
ContentData1	MC_DATAPROF4 DATA_MDX	Input signals *ContentData1* to *ContentData4* are used to determine which MOVIDRIVE® B actual values are transferred in each double word. (→ MC_DATAPROFILE4DATA_MDX)
ContentData2		
ContentData3		
ContentData4		
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_GetDataprofile4Data_MDX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the transferred MOVIDRIVE® B actual values are valid. • *TRUE*: Initialization is complete and the transferred actual values are valid. • *FALSE:* The connection between MOVIDRIVE® B and MOVI-PLC® is interrupted and the transferred actual values are invalid. For example, a termination of the connection can occur during the reset phase of MOVIDRIVE® B or when there is a fault on the system bus. In this case, the motor axis is in the *NOT_CONNECTED* state (→ Output signal *PLCopenState* of the function module MC_ConnectAxis_MDX). The data transfer restarts when the connection is established again and the input signal *Enable* is still set to *TRUE*.
Busy	BOOL	• *TRUE*: Initialization of the transfer is taking place • *FALSE:* The initialization of the transfer has not yet started, has completed successfully or was cancelled due to a fault.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during the execution of the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* displays the error code of the error that occurred (→ see Section "Error identifier").
Data1	DINT	The transferred MOVIDRIVE® B actual values can be read at the outputs *Data1* to *Data4.* The data is valid when the *TRUE* signal is issued at output signal *Done*.
Data2		
Data3		
Data4		

4.4.2 Function module MC_ReadParameter_MDX/MX



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Application You can use the function module MC_ReadParameter_MDX/MX on all motor axes.

Description The function module MC_ReadParameter_MDX/MX is used to read parameters (indices) of the drive inverter into the MOVI-PLC® control.

Input signals The behavior of the function module MC_ReadParameter_MDX/MX is dependent on the following input signals.

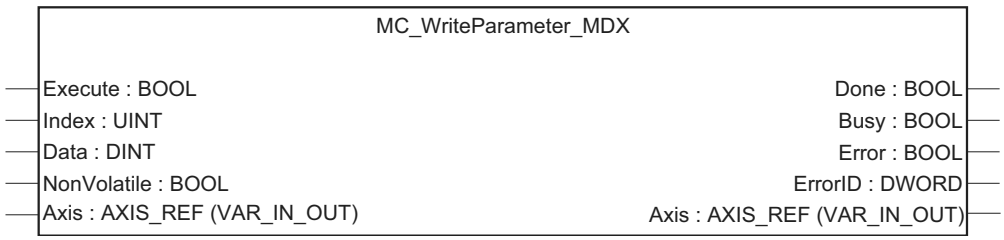
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the read process of the parameter. When a rising edge occurs at this input signal, the function module starts to transfer the parameter from the drive inverter to the MOVI-PLC® control.
Index	UINT	The input signal *Index* specifies which parameter is to be transferred from the inverter to the MOVI-PLC® control. The index number of the parameter can be displayed in the shell of the MOVITOOLS® MotionStudio software when you place your cursor in the relevant parameter field and press <CTRL + F1> for MOVIDRIVE® B. The subindex number is also displayed for MOVIAXIS®.
Subindex	UINT	The input signal *Subindex* is only available for function module MC_ReadParameter_MX and not for MC_ReadParameter_MDX. You can specify which parameter is to be transferred from the MOVIAXIS® servo inverter to the MOVI-PLC® control using the input signals *Subindex* and *Index*.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_ReadParameter_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the parameter was correctly transferred. • *TRUE*: The value of the parameter at the *Data* output is valid. • *FALSE:* The parameter has not been transferred.
Busy	BOOL	The output signal *Busy* shows whether the parameter is currently being transferred. • *TRUE*: The parameter is currently being transferred. • *FALSE:* The parameter is currently not being transferred.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during parameter transfer. • *FALSE:* No error has occurred.
ErrorID	DWORD	This output shows the error code of the error that occurred (→ Section "Error identifier").
Data	DINT	This output contains the transferred parameter value.

4.4.3 Function module MC_WriteParameter_MDX/MX



58175AXX

Application

You can use the function module MC_WriteParameter_MDX/MX on all motor axes.

Important:

Changing some parameters, which require certain settings for fault-free control of the drive inverter by the MOVI-PLC® control, can lead to unforeseeable operating states. Therefore, the function module MC_WriteParameter_MDX/MX must only be used by trained personnel or after testing the required functionality thoroughly, ensuring the protection of personnel and machinery.

Description

Function module MC_WriteParameter_MDX/MX is used to transfer parameters (indices) from the MOVI-PLC® control to the drive inverter.

Input signals

The behavior of the function module MC_WriteParameter_MDX/MX is dependent on the following input signals:

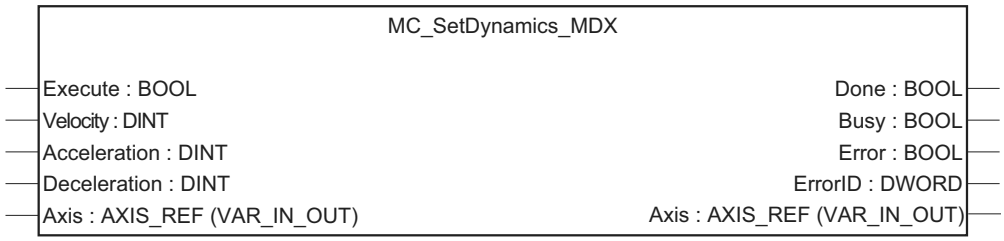
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the parameter transfer process. When a rising edge occurs at this input signal, the function module starts to transfer the parameter from the MOVI-PLC® control to the drive inverter.
Index	UINT	The input signal *Index* specifies which parameter is to be transferred from the MOVI-PLC® control to the drive. The index number of the parameter can be displayed in the shell of the MOVITOOLS® MotionStudio software when you place your cursor in the relevant parameter field and press <CTRL + F1> for MOVIDRIVE® B. The subindex number is also displayed for MOVIAXIS®.
Subindex	UINT	The input signal *Subindex* is only available for function module MC_ReadParameter_MX and not for MC_ReadParameter_MDX. You can specify which parameter is to be transferred from the MOVI-PLC® control to the MOVIAXIS servo inverter using the input signals *Subindex* and *Index.*
Data	DINT	The input signal *Data* contains the transferred parameter value.
NonVolatile	BOOL	The input signal *NonVolatile* specifies whether the parameter should be copied to the non-volatile memory. • *TRUE*: The parameter is transferred to the **non-volatile** memory of the drive inverter. The parameter value is still stored once the drive inverter is switched off and then on again. • *FALSE: The parameter is transferred to the volatile memory of the drive inverter. When the drive inverter is switched off and then back on again, the parameter is reset to its original value.*
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_WriteParameter_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the parameter was correctly transferred. • *TRUE*: The parameter has been successfully transferred from the MOVI-PLC® control to the drive inverter. • *FALSE:* The parameter has not been transferred.
Busy	BOOL	The output signal *Busy* shows whether the parameter is being transferred. • *TRUE*: The parameter is currently being transferred. • *FALSE:* The parameter is currently not being transferred.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during parameter transfer. • *FALSE:* No error has occurred.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ see Section "Error identifier").

4.4.4 Function module MC_SetDynamics_MDX/MX



58176AXX

Application

You can use the function module MC_SetDynamics_MDX/MX on all motor axes.

Description

The function module MC_SetDynamics_MDX/MX is used to change the dynamic parameters while executing a task of the continuous or discrete motion function module and function modules MC_AxisStop_MDX/MX or MC_StopSensorless_MDX. In doing so, the input signals *Velocity*, *Acceleration* and *Deceleration* determine the dynamic behavior of the rotation.

If the function module MC_SetDynamics_MDX/MX is executed before a continuous or discrete motion function module, the set dynamic parameters are overwritten with their input signals while executing the motion function module. The behavior in conjunction with the function module MC_QuickEnable_MDX/MX is described in the section "Function module MC_QuickEnable_MDX/MX" in the "Influence" subsection.

Input signals

The behavior of the function module MC_SetDynamics_MDX/MX is dependent on the following input signals.

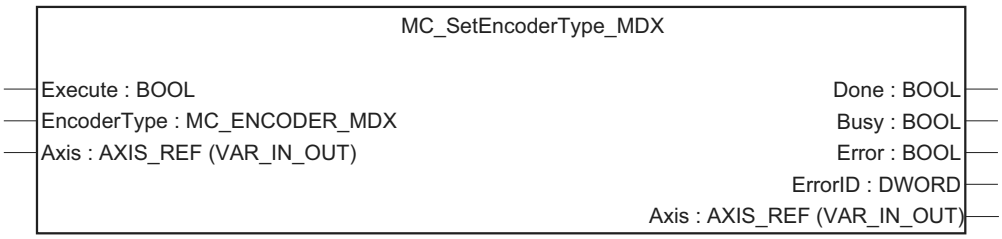
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* starts the task of the function module. When a rising edge occurs at this input signal, the function module changes the dynamic parameters of the motor rotation according to the input signals *Velocity, Acceleration* and *Deceleration*.
Velocity	DINT	The input signal *Velocity* specifies the motor speed during the constant speed phase.
Acceleration	DINT	The input signal *Acceleration* specifies the acceleration (increase of kinetic energy in the motor).
Deceleration	DINT	The input signal *Deceleration* specifies the braking deceleration (decrease of kinetic energy in the motor).
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_SetDynamics_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the new dynamic parameters *Velocity, Acceleration* and *Deceleration* are successfully written. • *TRUE*: Parameter has been written successfully. • *FALSE:* Parameter not yet fully written.
Busy	BOOL	The output signal *Busy* shows whether the new dynamic parameters are transferred to the drive inverters. • *TRUE*: New dynamic parameters are transferred to the drive inverter. • *FALSE:* No new dynamic parameters are transferred to the drive inverter.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No error has occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.4.5 Function module MC_SetEncoderType_MDX/MX



59366AXX

Application

You can use the function module MC_SetEncoderType_MDX/MX only on motor axes with encoders.

Description

The encoder source of the MOVIDRIVE® B / MOVIAXIS® is initially set in the control configuration for the module parameters in MOVIDRIVE® B / MOVIAXIS®. You can use the function module MC_SetEncoderType_MDX/MX to change the encoder source in the program sequence.

Note:

Changing the encoder source can cause balance movements of the motor axis by shifting the machine zero.

Input signals

The behavior of the function module MC_SetEncoderType_MDX/MX is dependent on the following input signals:

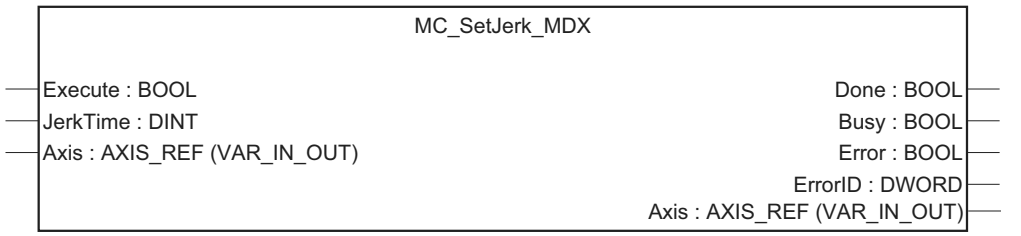
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* starts the task of the function module. When a rising edge occurs at this input signal, the encoder changeover starts.
EncoderType	MC_ENCODER_MDX/MX	The input signal *EncoderType* specifies the encoder source to be used. The following encoder sources can be selected for MOVIDRIVE® B: • MDX_ENCODER_X15 Motor encoder • *MDX_ENCODER_X14 External encoder* • MDX_ENCODER_SSI Absolute encoder Function reserved in conjunction with MOVIAXIS® at time of publication.
Axis	AXIS_REF	This input specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_SetEncoderType_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the changeover of the encoder source was successful. • *TRUE*: The encoder source changeover was successful. • *FALSE:* The encoder source changeover was not successful.
Busy	BOOL	The output signal *Busy* shows whether the changeover of the encoder source is underway. • *TRUE*: The encoder source changeover is underway. • *FALSE:* The encoder source changeover is not underway.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during the action. • *FALSE:* No error has occurred.
*Error*ID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.4.6 Function module MC_SetJerk_MDX/MX



Application

You can only use the function module MC_SetJerk_MDX/MX on motor axes with encoders.

Prerequisite

For the function module MC_SetJerk_MDX/MX to be executed, the motor axis must be in PLCopenState *STANDSTILL* (output signal of the function module MC_ConnectAxis_MDX).

Description

- The function module MC_SetJerk_MDX is used to activate and deactivate the jerk limitation of the positioning function modules. The function module MC_SetJerk_MDX for **MOVIDRIVE® B** transfers the jerk time to the drive inverter.

You must not change the jerk time of the drive inverter while a travel task is being performed.

- The function module MC_SetJerk_MX for **MOVIAXIS®** is used to set the jerk limitation for all discrete and continuous motion function modules. The function module MC_SetJerk_MX transfers the jerk in units of $1/(\min \times s^2)$ to the servo inverter.

You must only change the jerk setting in the servo inverter during standstill or movement with constant speed of the connected drive.

- The *JerkTime* input is only available for the function module MC_SetJerk_MDX for **MOVIDRIVE® B**.
- The *Jerk* input is only available for the function module MC_SetJerk_MX for **MOVIAXIS®**.

Input signals

The behavior of the function module MC_SetJerk_MDX/MX is dependent on the following input signals:

Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the jerk time transfer process. When a rising edge occurs at this input signal, the function module starts to transfer the jerk time from the MOVI-PLC® control to the drive inverter.
JerkTime (Only for MOVIDRIVE® B)	DINT	The input signal *JerkTime* specifies the jerk time for MOVIDRIVE® B (unit: ms, max. setting range 0.5 ... 2000). "0": Linear ramp type "> 5": Jerk-limited ramp type. A positioning operation is lengthened by the jerk time compared to the corresponding positioning operation with a linear ramp.
Jerk (Only for MOVIAXIS®)	DINT	The input signal *Jerk* specifies the jerk for MOVIAXIS® (parameter *P9582.1 Application limit maximum jerk*). It is used for discrete and continuous motion tasks (unit: 1/(min x s^2), max. setting range 0 ... (2^{31} – 1)).
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_SetJerk_MDX/MX has the following output signals:

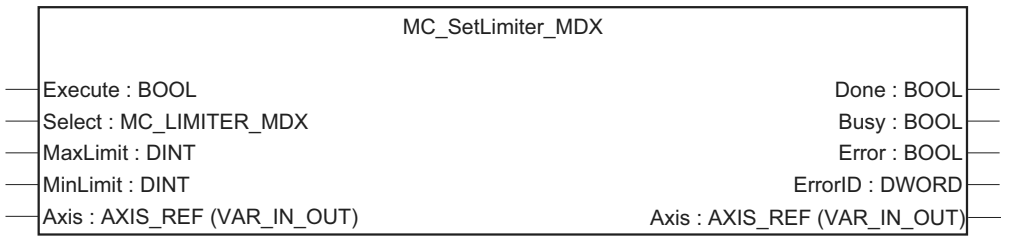
Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the jerk time was correctly transferred. • *TRUE:* The jerk time has been transferred from the MOVI-PLC® control to the inverter successfully. • *FALSE:* Parameter not yet fully written.
Busy	BOOL	The output signal *Busy* shows whether the jerk time is being transferred. • *TRUE*: The jerk time is being transferred. • *FALSE:* The jerk time is not being transferred.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during the transfer of the jerk time. • *FALSE:* No error has occurred.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

Note:

For speed-controlled travel tasks, the **MOVIDRIVE® B** drive inverter automatically uses a linear ramp. When the inverter then executes a positioning task, it automatically switches back to the set ramp or jerk time using the function module MC_SetJerk_MDX.

The set jerk time is active for each travel task for **MOVIAXIS®**.

4.4.7 Function module MC_SetLimiter_MDX/MX



Application You can use the function module MC_SetLimiter_MDX/MX on all motor axes.

Description The function module MC_SetLimiter_MDX/MX is used to transfer one of the following parameters from the MOVI-PLC® control to the inverter:

- *Minimum speed* (only for MOVIDRIVE® B)
- *Maximum speed*
- *Current limit*
- *Torque limit*
- *CCW limit switch* software (only for MOVIDRIVE® B)
- *CW limit switchsoftware* (only for MOVIDRIVE® B)
- Maximum acceleration (only for MOVIAXIS®)
- Maximum deceleration (only for MOVIAXIS®)
- Maximum emergency stop ramp (only for MOVIAXIS®)
- Maximum jerk (only for MOVIAXIS®)

Input signals

The behavior of the function module MC_SetLimiter_MDX/MX is dependent on the following input signals:

Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* starts the task of the function module. When a rising edge occurs at this input signal, the function module transfers the parameter specified by the input signal *Select*.
Select	MC_LIMITER _MDX/MX	The input signal *Select* specifies which parameter the function module is to transfer from the MOVI-PLC® control to the inverter. MOVIDRIVE® B: • *MDX_P301_P302_SPEED_LIMIT*: The function module transfers the parameters *Minimum speed* and *Maximum speed*. (Unit: 1/min, maximum setting range 0... 6100) • *MDX_P303_CURRENT_LIMIT*: The function module transfers the parameter *Current limit*. (Unit: % I_N, maximum setting range 0... 150 % (BG0 200%)) • *MDX_P304_TORQUE_LIMIT*: The function module transfers the parameter *Torque limit*. (Unit: % I_N, maximum setting range 0 ... 150 (BG0: 200%)) • *MDX_P920_SW_LIMIT_SWITCH_CW*: The function module transfers the parameter *Softwarelimit switch CW*. (Unit: increments, maximum setting range -(2^{31}-1) ... (2^{31}-1)) • *MDX_P921_SW_LIMIT_SWITCH_CCW*: The function module transfers the parameter *Software limit switch CCW*. (Unit: increments, maximum setting range -(2^{31}-1) ... (2^{31}-1)) MOVIAXIS®: • *MX_SPEED_LIMIT_SYSTEM*: The function module transfers the parameter *System limit maximum speed*. (User-defined units, maximum setting range 0 ... 10000000) • *MX_SPEED _LIMIT_APPLICATION*: The function module transfers the parameter *Application limit maximum speed*. (User-defined units, maximum setting range 0 ... 10000000) • *MX_EMERGENCY_STOP_DEC_LIMIT*: The function module transfers the parameter *Emergency stop deceleration*. (User-defined units, maximum setting range 0 ... 2147483647) • *MX_ACC_LIMIT_SYSTEM*: The function module transfers the parameter *System limitmaximum acceleration*. (User-defined units, maximum setting range 0 ... 2147483647) • *MX_ACC_LIMIT_APPLICATION*: The function module transfers the parameter *Application limitmaximum acceleration*. (User-defined units, maximum setting range 0 ... 2147483647) • *MX_DEC_LIMIT_SYSTEM*: The function module transfers the parameter *System limitmaximum deceleration*. (User-defined units, maximum setting range 0 ... 2147483647) • *MX_DEC_LIMIT_APPLICATION*: The function module transfers the parameter *Application limitmaximum deceleration*. (User-defined units, maximum setting range 0 ... 2147483647) • *MX_CURRENT_LIMIT*: The function module transfers the parameter *Current limit*. (Unit: mA, maximum setting range 0... 2000000) • *MX_TORQUE_LIMIT_SYSTEM*: The function module transfers the parameter *System limitmaximum torque*. (Unit: Torque 10^{-3} % rated motor torque, maximum setting range 0 ...1000000) • *MX_TORQUE_LIMIT_APPLICATION*: The function module transfers the parameter *Application limitmaximum torque*. (Unit: Torque 10^{-3} % rated motor torque, maximum setting range 0 ...1000000) • *MX_JERK_LIMIT_SYSTEM*: The function module transfers the parameter *System limit maximum jerk.* (Unit: 1/(min×s^2), maximum setting range 0 ...2147483647) • *MX_JERK_LIMIT_APPLICATION*: The function module transfers the parameter *Application limit maximum jerk*. (Unit: 1/(min×s^2), maximum setting range 0 ...2147483647)

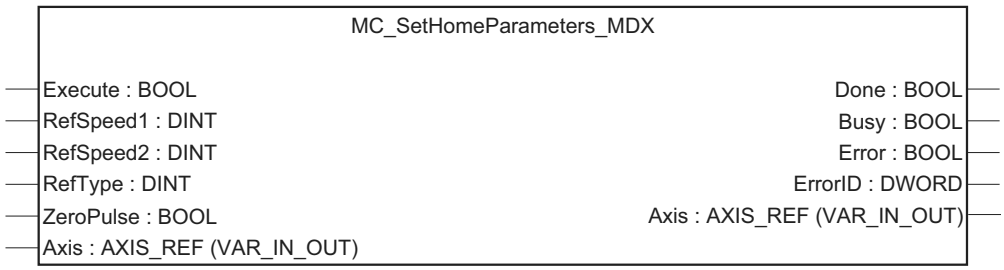
Input signal	Type	Meaning
MaxLimit	DINT	The input signal *MaxLimit* specifies the transferred parameter value. When the input signal *Select* is set to *MDX_P301_302_SPEED_LIMIT*, this input signal specifies the value for the parameter *P302*. (Unit and maximum setting range → Input signal *Select*)
MinLimit	DINT	This input is only used when the input *Select* is set to *MDX_P301_302_SPEED_LIMIT*. In this case, it specifies the value for parameter *P301*. (Unit: 1/min, maximum setting range 0... 6100)
Axis	AXIS_REF	This input specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_SetLimiter_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the parameter was correctly transferred. • *TRUE*: The parameter has been transferred successfully from the MOVI-PLC® control to the drive inverter. • *FALSE:* Parameter not yet fully written.
Busy	BOOL	The output signal *Busy* shows whether the parameter is being transferred. • *TRUE*: The parameter is currently being transferred. • *FALSE:* The parameter is currently not being transferred.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during parameter transfer. • *FALSE:* No error has occurred.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.4.8 Function module MC_SetHomeParameters_MDX/MX



58180AXX

Application

You can use the function module MC_SetHomeParameters_MDX/MX on motor axes with encoders.

Description

The function module MC_SetHomeParameters_MDX/MX is used to set the parameters that are required for the motor axis to perform reference travel. The function module MC_SetHomeParameters_MDX/MX transfers parameters required for reference travel from the MOVI-PLC® control to the inverter.

For more information on the reference travel parameters and the reference travel types, refer to the online help of the MOVITOOLS® MotionStudio software.

Effect

For reference travel with MOVIAXIS®, you can set additional parameters in the parameter tree (FCB12, reference travel) or by using the function module MC_WriteParameter_MX.

Input signals

The behavior of the function module MC_SetHomeParameters_MDX/MX is dependent on the following input signals:

Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the parameter transfer process. When a rising edge occurs at this input signal, the function module starts to transfer the parameters from the MOVI-PLC® control to the inverter.
RefSpeed1	DINT	The input signal *RefSpeed1* specifies reference speed 1.
RefSpeed2	DINT	The input signal *RefSpeed2* specifies reference speed 2.
RefType	DINT	The input signal *RefType* specifies the type of reference travel (0 ...8 for MOVIDRIVE® B, 0 ... 10 for MOVIAXIS®).
ZeroPulse	BOOL	The input signal *ZeroPulse* shows whether the motor axis is referenced to the zero pulse during reference travel. • *TRUE*: The motor axis is referenced to the zero pulse during reference travel. • *FALSE:* The motor axis is not referenced to the zero pulse during reference travel.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

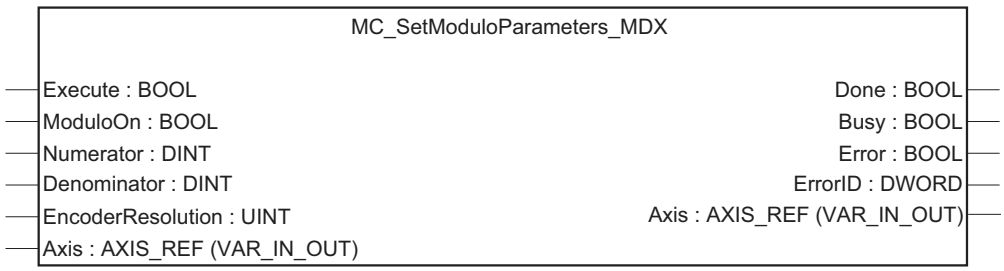
Reference travel type 5 (= no reference travel) for MOVIDRIVE® B corresponds to the reference travel type 6 for MOVIAXIS®.

Output signals

The function module MC_SetHomeParameters_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether all parameters were correctly transferred. • *TRUE*: All parameters have been transferred successfully from the MOVI-PLC® control to the drive inverter. • *FALSE:* Parameter not yet fully written.
Busy	BOOL	The output signal *Busy* shows whether the parameters are being transferred. • *TRUE*: The parameters are being transferred. • *FALSE:* The parameters are not being transferred.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during the transfer of the parameters. • *FALSE:* No error has occurred.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.4.9 Function module MC_SetModuloParameters_MDX/MX



58181AXX

Application

You can use the function module MC_SetModuloParameters_MDX/MX only on motor axes with encoders.

Description

The function module MC_SetModuloParameters_MDX/MX is used to set the parameters that are required for positioning applications of the motor axis in modulo format. The function module MC_SetModuloParameters_MDX/MX transfers the parameters required for positioning applications in modulo format from the MOVI-PLC® control to the inverter.

For more information on the modulo parameters, refer to the online help of the MOVITOOLS® MotionStudio software.

Notes:

- The MPLC_CalcLCD function (Calculate Least Common Denominator) is available in the `MPLCUtilities` library for calculating the least common denominator of two natural numbers.
- The inputs *ModuloOn* to *EncoderResolution* are only available for function module MC_SetModuloParameters_MDX for **MOVIDRIVE® B**.
- The inputs *Mode* to *Underflow* are only available for function module MC_SetModuloParameters_MX for **MOVIAXIS®**.

Input signals

The behavior of the function module MC_SetModuloParameters_MDX/MX is dependent on the following input signals:

Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the parameter transfer process. When a rising edge occurs at this input signal, the function module starts to transfer the parameters from the MOVI-PLC® control to the drive inverter.
ModuloOn (Only for MOVI-DRIVE® B)	BOOL	Activation of the modulo function by setting the parameter P960 to "SHORT".
Numerator (Only for MOVI-DRIVE® B)	DINT	Simulation of the gear unit by entering the number of teeth. (Unit: Number of teeth, setting range 1 ... 2^{31})
Denominator (Only for MOVI-DRIVE® B)	DINT	
EncoderResolution (Only for MOVI-DRIVE® B)	UINT	The input signal *EncoderResolution* specifies the resolution of the connected encoder system. (Unit: increments, setting range 1 ... 20000)
Mode (Only for MOVIAXIS®)	MC_POSMODE_MX	• MX_ABS • MX_REL • MX_MODULO_ABS_CW • MX_MODULO_REL_CW • MX_MODULO_ABS_CCW • MX_MODULO_REL_CCW • MX_MODULO_ABS_SHORT • MX_MODULO_REL_SHORT (See MOVIAXIS®, FCB09 operating instructions)
Overflow (Only for MOVIAXIS®)	DINT	Parameter *Modulo overflow* (e.g. 359 degrees for corresponding setting of user-defined units) (See MOVIAXIS® operating instructions)
Underflow (Only for MOVIAXIS®)	DINT	Parameter *Modulo underflow* (e.g. "0") (See MOVIAXIS® operating instructions)
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_SetModuloParameters_MDX/MX has the following output signals:

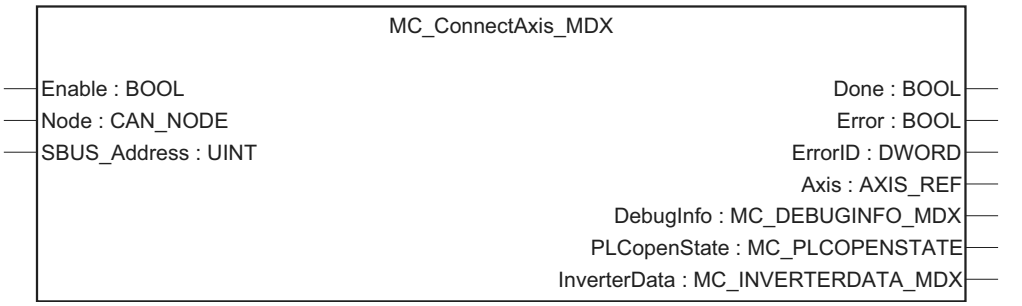
Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether all parameters were correctly transferred. • *TRUE*: All parameters have been transferred from the MOVI-PLC® control to the inverter successfully. • *FALSE:* Parameter not yet fully written.
Busy	BOOL	The output signal *Busy* shows whether the parameters are being transferred. • *TRUE*: The parameters are being transferred. • *FALSE:* The parameters are not being transferred.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during the transfer of the parameters. • *FALSE:* No error has occurred.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.5 MDX/MX_Main directory

The MDX/MX_Main directory includes function modules for the management of:

- Communication between the MOVI-PLC® control and the MOVIDRIVE® MDX60B/61B inverters
- Inverters (e.g. enable, reset)

4.5.1 Function module MC_ConnectAxis_MDX/MX



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Application

You can use the function module MC_ConnectAxis_MDX on all motor axes.

To ensure that communication between the MOVI-PLC® control and the MOVIDRIVE®/MOVIAXIS® does not terminate, a different instance in each program cycle must be called for each motor axis.

Note:

If the function module MC_ConnectAxis_MDX is not cyclically called up, the inverter issues a communication error (F46 for MOVIDRIVE® B, E67 for MOVIAXIS®) and changes to the "No enable" state.

Prerequisites

The following prerequisites must be fulfilled to establish communication between the MOVI-PLC® control and a **MOVIDRIVE® B** via the function module MC_ConnectAxis_MDX.

- The system bus address set at the function module MC_ConnectAxis_MDX and in the control configuration must match the address set in the inverter parameters (*P881* for SBus 1, connector X12).
- The baud rate set in the control configuration must match the baud rate set in the inverter parameters (*P884* for SBus 1, connector X12).

The startup assistant helps you to set these parameters.

The following prerequisites must be fulfilled to establish communication between the MOVI-PLC® control and a **MOVIAXIS®** via the function module MC_ConnectAxis_MX.

- The transmission rate set at the power supply module (switch S1 to S4) and the basic address for the system bus (MOVIAXIS® signal bus) must correspond with the module parameters set in the control configuration. The basic address corresponds to the SBus address of the axis module directly to the right of the power supply module. The axis modules to the right are automatically assigned increasing addresses that must be correspondingly set in the control configuration for the control of the motor axes.
- The SBus address set at the function module MC_ConnectAxis_MX for each axis must match the address set in the control configuration.

Description

Function module MC_ConnectAxis_MDX/MX

- Establishes the connection with the controlled motor axis
- Is called cyclically in the program and creates a process image of the motor axes at the place where it is called

Notes:

The process image for the inputs and outputs is created when the function module MC_ConnectAxis_MDX/MX is called. The process image is not created at the start and end of the control cycle.

You must use the function module MC_ConnectAxisSimulation_MDX/MX for the activated simulation of the inverter or MOVI-PLC®.

- Activate the simulation of the MOVI-PLC® using the following menu items:

  PLC editor → Menu [Online] → Menu item [Simulation]
- Proceed as follows for the inverter simulation:

  PLC editor → [Resources] tab→ Double click on [Control configuration] → Select [MOVIDRIVE® MDX B] → Select the [Module parameter] tab in the right window → Select entry [Simulation] in the dropdown menu of the entry [Operation mode]

Settings

The function module MC_ConnectAxis_MDX/MX specifies which interface the MOVI-PLC® control (system bus CAN 1/2) is connected to and the system bus address that is connected to the controlled inverter via this function module.

Return values

The function module MC_ConnectAxis_MDX/MX provides you with various pieces of information, including:

- Reference of the motor axis. This virtual address is used to access other function modules on the motor axis.
- Debugging information
  - State of the system bus
  - Capacity utilization of the parameter channel
  - And so on
- Current state (→ Section "State diagram")
- Inverter data
  - Inverter state
  - Actual position of the motor axis
  - Actual speed of the motor axis
  - And so on

For more details, refer to the section "Output signals".

Effect

The following parameters of MOVIDRIVE® B are described once when the MOVI-PLC® control is connected for the first time to MOVIDRIVE® B via the function module MC_ConnectAxis_MDX.

Parameter	Meaning	Value entered
P885	SBus 1 synchronization ID	128
P887	Synchronization External control 1/2	On

After these parameters have been downloaded, the MOVI-PLC® control loads an IPOS$^{lus®}$ program required for communication once.

The following parameters of the MOVIDRIVE® B are changed each time the power supply is switched on or when the MOVI-PLC® control is reset during the initialization of the function module MC_ConnectAxis_MDX (first call with *Enable* = *TRUE*):

Parameter	Meaning	
P941	Source actual position	Dependent on the "Encoder type" setting in the control configuration for the module parameters of the inverter.
P938 / P939	IPOS speed	Optimized for the process

Input signals

The behavior of the function module MC_ConnectAxis_MDX/MX is dependent on the following input signals:

Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module. The behavior of the function module differs from the general behavior of the input signal *Enable* according to section 4.1. • *TRUE*: When the function module is called for the first time by setting *Enable = TRUE* , the function module is activated and the applied input signals are adopted. In all the following cycles of the MOVI-PLC® control, the function module must still be called to prevent communication errors between the MOVI-PLC® control and the inverter in *OperationMode NORMAL* (setting in the control configuration). However, regardless of the status of the input signal *Enable* , changes to the input signals are no longer adopted in the following cycles. The function module can only be reactivated and use the modified input signals after the MOVI-PLC® control has been reset. • *FALSE*: The task of the function module will not be executed after the MOVI-PLC® control has been switched on or reset as long as the input signal *Enable* is set to *FALSE*. However, if the input signal *Enable* has been set to *TRUE* once, the input signal *Enable* no longer has any function.
Node	CAN_NODE	The input signal *Node* is used to set the CAN bus node to which the inverter is connected. • SBUS_NODE_1: CAN 1 (connector X33 for DHP11B; X26 for compact control) • SBUS_NODE_2: CAN 2 (connector X32 for DHP11B)
SBUS_Address	UINT	The input signal *SBUS_Address* is used to enter the system bus address of the connected inverter.

Note:

To transfer the input signals *Node* or *SBUS_Address*, you have to trigger a "Reset" on the MOVI-PLC® control (in the PLC editor, menu item [Online] / [Reset]).

Output signals

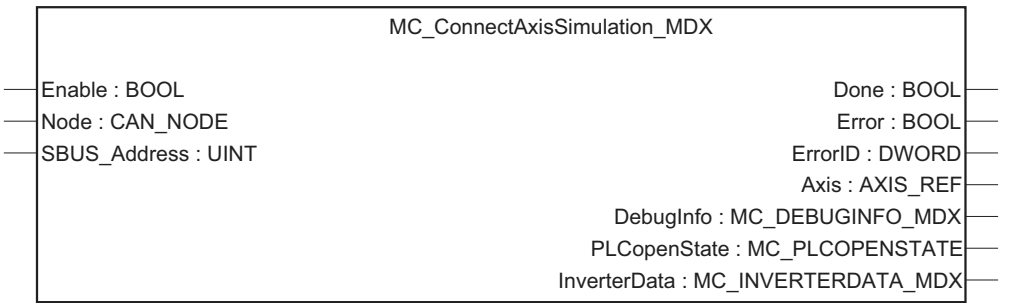
The function module MC_ConnectAxis_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the initialization of the function module is complete. • *TRUE*: Function module MC_ConnectAxis_MDX has completed initialization and set up communication with the drive inverter. • *FALSE:* Initialization is not yet complete or there is a communication error.
Error	BOOL	The output signal *Error* shows whether an error occurred. • *TRUE*: An error has occurred during the execution of the function module. • *FALSE:* No error has occurred.
*Error*ID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").
Axis	AXIS_REF	The output signal *Axis* displays the axis reference. The output signal must be transmitted to all function modules that refer to this physical motor axis.
DebugInfo	MC_DEBUGINFO_MDX/MX	The output signal *DebugInfo* is used to locate any errors in the *Operation-Mode Debug* (setting in the control configuration for the module parameters of the drive inverter). • *ParameterChannelIdleTime:* This value shows the availability of the parameter channel in %. 0%: A parameter telegram is processed each time an MC_ConnectAxis_MDX/MX/MC07 instance is executed. 100%: No parameter telegrams are processed. • *PDOxxTransmitCount:* Number of PDOxx sent from the MOVI-PLC® control to the inverter. • *PDOxxTransmitTimeStamp:* Time stamp of the PDOxx sent from the MOVI-PLC® control. • *PDOxxReceiveCount:* Number of PDOxx sent from the inverter to the MOVI-PLC® control. • *PDOxxReceiveTimeStamp:* Time stamp of the PDOxx received by the MOVI-PLC® control. • *NumberOfReceiveErrors:* Number of errors that occurred when receiving data. • *NumberOfTransmitErrors:* Number of errors that occurred when sending data. • *StateInitConnectAxis*: State of function module MC_ConnectAxis_MDX
PLCopenState	MC_PLCOPEN-STATE	The output signal *PLCopenState* shows information on the operating state of the motor axis (→ Section "State diagram"). • *NOT_CONNECTED* • *STANDSTILL* • *HOMING* • *DISCRETE_MOTION* • *CONTINUOUS_MOTION* • *STOPPING* • *ERRORSTOP*

Output signal	Type	Meaning
InverterData	MC_INVERTER DATA_MDX	MOVIDRIVE® B: The output signal *InverterData* shows information on the operating status of the motor axis. • *Error:* An error has occurred in the inverter. • *Referenced*: The inverter has been referenced. • *InverterStatus*: The status of the inverter corresponds to the 7-segment display on the drive inverter. • *FaultStatus*: The error number of the drive inverter corresponds to the 7-segment display when a fault occurs. • *ActualPosition:* Current actual position of the motor axis in the drive inverter. The encoder used is set in the control configuration. • *ActualModuloPosition*: Current actual modulo position of the inverter. The encoder used is set in the control configuration. • *SetpointSpeed:* Setpoint speed of the motor axis in the inverter. • *ActualSpeed:* Actual speed of the motor axis in the inverter • *ActualCurrent:* Current active current of inverter (Unit: 0.1% I_N) • *InverterReady:* The inverter is ready for operation.
	MC_INVERTER DATA_MX	MOVIAXIS® B: The output signal *InverterData* shows information on the operating status of the motor axis. • *Error:* An error has occurred in the servo inverter. • *Referenced*: The servo inverter is referenced. • *InverterStatus*: The status of the servo inverter corresponds to the 7-segment display on the servo inverter. • *FaultStatus*: The error number of the servo inverter corresponds to the 7-segment display when a fault occurs. • *FaultSubStatus*: Error number of the servo inverter when an error occurs. • *ActualPosition:* Current actual position of the motor axis in the servo inverter. • *ActualModuloPosition*: Current actual modulo position of the servo inverter. • *ActualSpeed:* Actual speed of the motor axis in the servo inverter. • *ActualCurrent:* Actual active current of the servo inverter (Unit: mA) • *InverterReady*: The servo inverter is ready for operation.

The data transfer between the drive inverter and MOVI-PLC® is described in the appendix, "Overview of the transferred MOVIDRIVE® actual values".

4.5.2 Function module MC_ConnectAxisSimulation_MDX/MX



Application

You can use the function module MC_ConnectAxisSimulation_MDX/MX on all motor axes.

A different instance must be cyclically called for each motor axis.

Prerequisites

If the inverter / servo inverter is to be simulated, the module parameter *Operation mode* of the inverter / servo inverter that is referred to by the function module must be set to "Simulation" in the control configuration.

To simulate the MOVI-PLC® control, select the [Simulation] menu item in the [Extras] menu in the PLC editor.

You can also activate both simulations (inverter / servo inverter and MOVI-PLC®) simultaneously. Mixed operation with simulated and real motor axes is also possible.

Description

The function module MC_ConnectAxisSimulation_MDX/MX replaces the function module MC_ConnectAxis_MDX/MX for activated simulation of inverter or MOVI-PLC®.

If the function module MC_ConnectAxisSimulation_MDX/MX is used instead of MC_ConnextAxis_MDX/MX, the function modules MC_MoveAbsoluteModulo_MDX, MC_MoveRelativeModulo_MDX and MC_MoveModulo_MX of the corresponding motor axis cannot be executed.

When attempting to execute the function modules, the *TRUE* signal is issued at the *Error* output with the *ErrorID E_IEC_PARAMETER_VALUE_OUT_OF_RANGE*.

Input signals

The behavior of the function module MC_ConnectAxisSimulation_MDX/MX is dependent on the following input signals:

Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module. The behavior of the function module differs from the general behavior of the input signal *Enable* according to section 4.1. • *TRUE*: When the function module is called for the first time by setting *Enable = TRUE* , the function module is activated and the applied input signals are adopted. In all the following cycles, the MOVI-PLC® control must continue to call the function module. However, regardless of the status of the input signal *Enable*, changes to the input signals are no longer adopted in the following cycles. The function module can only be reactivated and use the modified input signals after the MOVI-PLC® control has been reset. • *FALSE*: The task of the function module will not be executed after the MOVI-PLC® control has been switched on or reset as long as the input signal *Enable* is set to *FALSE*. However, if the input signal *Enable* has been set to *TRUE* once, itno longer has any function.
Node	CAN_NODE	The input signal *Node* is used to set the CAN bus node to which the inverter/servo inverter is connected with the MOVI-PLC® and inverter hardware in real-time operation. • SBUS_NODE_1: CAN 1 (connector X33 for DHP11B; X26 for compact control) • SBUS_NODE_2: CAN 2 (connector X32 for DHP11B)
SBUS_Address	UINT	The input signal *SBUS_Address* is used to specify the SBus address of the inverter / servo inverter connected with the inverter hardware in real-time operation.

Note:

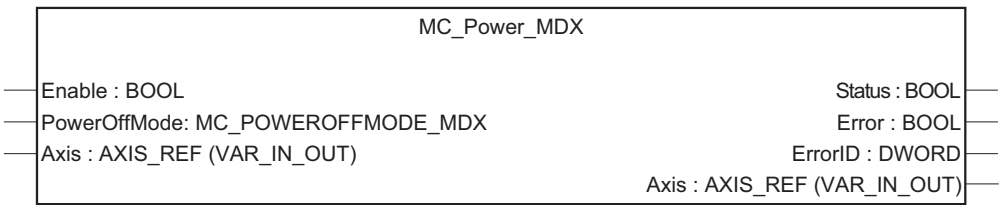
To transfer the input signals *Node* or *SBUS_Address*, you have to trigger a Reset on the MOVI-PLC® control (in the PLC editor, menu item [Online] / [Reset]) or switch the voltage supply of the MOVI-PLC® control off and on again.

Output signals

The function module MC_ConnectAxisSimulation_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the initialization of the function module completed. • *TRUE*: The function module MC_ConnectAxisSimulation_MDX/MX has completed initialization. • *FALSE:* Initialization has not yet been completed.
Error	BOOL	The output signal *Error* shows whether an error occurred. • *TRUE*: An error has occurred during the execution of the function module. • *FALSE:* No error has occurred.
*Error*ID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").
Axis	AXIS_REF	The output signal *Axis* displays the axis reference. The output signal must be transmitted to all function modules that refer to this physical motor axis.
DebugInfo	MC_DEBUGINFO_MDX/MX	No data is available at this output signal for function module MC_ConnectAxisSimulation_MDX/MX.
PLCopenState	MC_PLCOPEN-STATE	The output signal *PLCopenState* shows information on the operating state of the simulated motor axis (→ Section "State diagram"): • *NOT_CONNECTED* • *STANDSTILL* • *HOMING* • *DISCRETE_MOTION* • *CONTINUOUS_MOTION* • *STOPPING* • *ERRORSTOP*
InverterData	MC_INVERTERDATA_MDX	MOVIDRIVE® B: The output signal *InverterData* shows information on the operating status of the motor axis. • *Error:* Always *FALSE*. • *Referenced*: Always TRUE. • *InverterStatus:* – "1": Controller inhibit – "2": No enable – "5": Speed control – "A": Positioning • *FaultStatus*: Always "0". • *ActualPosition: Value of the profile generator.* • *ActualModuloPosition*: Always "0". • *SetpointSpeed: Value of the profile generator.* • *ActualSpeed: Value of the profile generator.* • *ActualCurrent: Always "0".* • *InverterReady:* Always *TRUE*.
	MC_INVERTERDATA_MX	MOVIAXIS®: The output signal *InverterData* shows information on the operating status of the motor axis. • *Error:* Always *FALSE*. • *Referenced*: Always TRUE. • *InverterStatus:* – "1": Controller inhibit – "5": Speed control – "9": Positioning – "12": Homing – "13": No enable • *FaultStatus*: Always "0". • *FaultSubStatus*: Always "0". • *ActualPosition: Value of the profile generator.* • *ActualModuloPosition*: Always "0". • *ActualSpeed: Value of the profile generator.* • *ActualCurrent: Always "0".* • *InverterReady:* Always *TRUE*.

4.5.3 Function module MC_Power_MDX/MX



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Application

You can use the function module MC_Power_MDX/MX on all motor axes with encoders.

Note:

You must not call the function module MC_Power_MDX/MX on drives without encoders.

Description

The function module MC_Power_MDX switches a **MOVIDRIVE® B** unit

- On (inverter status A or 5, depending on the selected operating mode)
- Off (inverter status 1 or 2, depending on the PowerOffMode set)

The function module MC_Power_MX switches a **MOVIAXIS®** unit

- On (status 9 or 5, depending on the selected operating mode)
- Off (status 1 or 13, depending on the PowerOffMode set)

Interruption

If the input signal *Enable* is reset to *FALSE*, the function module MC_Power_MDX/MX interrupts the motion function module that is currently controlling the motor axis. The output signal *Active* of the motion function module is reset to *FALSE*.

When the input signal *Enable* of the function module MC_Power_MDX/MX is set to *TRUE* again, the motion function module continues its previous motion task.

Exception: When the axis is located in position control after positioning has been completed and the input signal *Enable* is set to *FALSE*, the axis can be moved out of its position due to mechanical forces. The axis returns to the last controlled target position after it has been enabled again.

Input signals

The behavior of the function module MC_Power_MDX/MX is dependent on the following input signals:

Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to switch the inverter on and off. The function module is executed with the current input values, even if the input signal *Enable* is set to *FALSE*. • *TRUE*: The inverter is switched on when the input signal *Enable* is set to *TRUE* (inverter status for MOVIDRIVE® B: A or 5 for MOVIAXIS®: 9 or 5. Depending on the operating mode that was set for the motor startup when switched on for the first time. In the operating mode of the last motion function module executed for further switching on processes.) • *FALSE*: The inverter is switched off when the input signal *Enable* is set to *FALSE* (inverter status for MOVIDRIVE® B: 1 or 2 for MOVIAXIS® 1 or 13 depending on *PowerOffMode* input).
PowerOffMode	MC_POWEROFFMODE_MDX/MX	The input signal *PowerOffMode* is used to set the status of the inverter when it is switched off using the function module MC_Power_MDX. • *MDX/MX_CTRL_INHIBIT*: The inverter status is now *Controller inhibit* (-> MDX: InverterStatus 1; MX: Status 1). The motor brake is applied. If no brake is installed, the motor will coast to a halt. • *MDX/MX_NO_ENABLE*: The inverter changes to the *No enable* status (-> MDX: InverterStatus 2; MX: Status 13). The motor is controlled and slowed down. Whether the motor brake is activated in the *No enable* status depends on the parameter *P730* for MOVIDRIVE® B and the indices 8584.0 and 9833.1 for MOVIAXIS®. The brake function is switched on as the default setting. This means the brake is activated shortly before reaching standstill for MOVIDRIVE® B and after reaching standstill for MOVIAXIS® (the brake is always activated in the *Controller inhibit* status). This input signal is also used to switch between *Controller inhibit* and *No enable* when the inverter is switched off (*Enable* = *FALSE*)
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

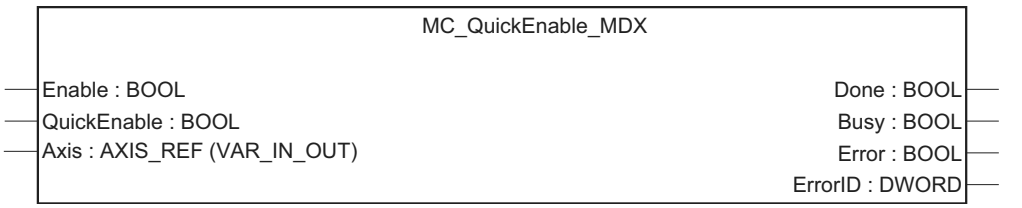
Output signals

The function module MC_Power_MDX/MX has the following output signals:

Output signal	Type	Meaning
Status	BOOL	The output signal *Status* shows whether the inverter is switched on or off. • *TRUE*: The inverter is switched on (inverter status for MOVIDRIVE® B: A or 5 for MOVIAXIS®: 9 or 5, depending on the set operating mode). • FALSE: The inverter is switched off (inverter status for MOVIDRIVE® B: 1 or 2 for MOVIAXIS® 1 or 13, depending on the PowerOffMode input signal)
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during the execution of the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

To be able to switch on the inverter using the function module MC_Power_MDX/MX, you must set the binary input DI00 (MOVIDRIVE® B: "/CONTROLLER INHIBIT", MOVIAXIS®: "OUTPUT STAGE ENABLE"). Additional binary input parameters set to "Enable", "Stop" or "Hold control" must be switched accordingly.

4.5.4 Function module MC_QuickEnable_MDX/MX



Application

You can only use the function module MC_QuickEnable_MDX/MX on motor axes with encoders.

Prerequisites

The motor axis must be enabled using the function module MC_Power_MDX/MX (input signal *Enable* = *TRUE*) before using the function module MC_QuickEnable_MDX/MX.

Description

When executing this function module, an enable request or enable revoke is immediately sent to the inverter / servo inverter depending on the assignment of the input signals. In contrast, the enable request or enable revoke is executed after the next execution of the function module MC_ConnectAxis_MDX/MX in the inverter when using the function module MC_Power_MDX/MX.

If the function module MC_QuickEnable_MDX/MX is first called with the input signals *Enable* = *TRUE* and *QuickEnable* = *FALSE* and a travel task is then started, the inverter starts the travel task directly after the following call up of the function module MC_QuickEnable_MDX/MX with both input signals = *TRUE*. The immediate cancellation of a travel task and its subsequent continuation is also possible using MC_QuickEnable_MDX/MX. To do this, you must assign the input signal *QuickEnable* to *FALSE* or *TRUE* for the corresponding call up procedures.

Notes:

- The function module MC_QuickEnable_MDX/MX has been optimized for short response times. As a single function module of the MPLCMotion_MDX/MX library, it can also be executed in another task, for example one that is faster than the other function modules.
- The function module MC_QuickEnable_MDX/MX blocks the task in which it was executed as well as all tasks with lower priority during its execution (until the send buffer of the system bus is free). For this reason, the function module MC_QuickEnable_MDX/MX can only be used specifically and sparingly.
- Use the function module MC_Stop_MDX/MX or MC_AxisStop_MDX/MX to stop a motor axis and cancel an active travel task.
- You must not use the function module MC_QuickEnable_MDX/MX in conjunction with modulo positioning.

Effect

- The start / stop ramps for activating or deactivating enable using MC_QuickEnable_MDX/MX can be set with the function module MC_SetDynamics_MDX/MX. If a continuous motion travel task is executed between the execution of MC_SetDynamics_MDX/MX and MC_QuickEnable_MDX/MX, the dynamic parameters set at the associated function module are also used for the execution of MC_QuickEnable_MDX/MX. The execution of a discrete motion travel task does not influence dynamic parameters used by MC_QuickEnable_MDX/MX.
- The acceleration / braking movement triggered by the function module MC_QuickEnable_MDX for MOVIDRIVE® B is executed using the ramps "t11 up/down CW/CCW" in the parameters P130 to P133. The startup assistant helps you to set these parameters.
- The brake function should be switched off so that the inverter can start as soon as possible when enabled with MC_QuickEnable_MDX/MX (for MOVIDRIVE® B P730; indices 8584.0 and 9833.1 for MOVIAXIS®).

Input signals

The behavior of the function module MC_QuickEnable_MDX/MX is dependent on the following input signals:

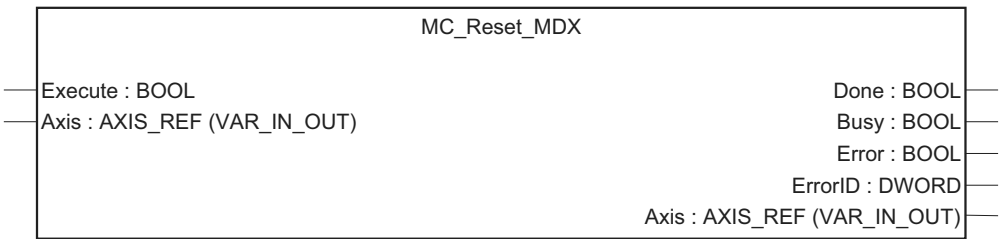
Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module. The task of the function module is only executed when the input signal *Enable* is set to TRUE.
QuickEnable	BOOL	The input signal *QuickEnable* is used to switch the inverter / servo inverter on and off. • *TRUE:* The inverter / servo inverter is switched on when the input signal *QuickEnable* is set to *TRUE* (in the operating mode that was active before deactivating enable). • FALSE: The inverter / servo inverter is switched off when the input signal *Enable* is set to *FALSE* (MOVIDRIVE® B: Status 2; MOVIAXIS®: Status 13, depending on the *PowerOffMode* input of the function module MC_Power_MDX/MX).
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_QuickEnable_MDX/MX has the following output signals:

Output	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the enable command was issued or revoked. • *TRUE*: Enable command was successfully issued. • *FALSE:* Enable command was not successfully issued.
Busy	BOOL	The output signal *Busy* shows whether the enable command is being issued or revoked. • *TRUE*: Enable command is being issued or revoked. • *FALSE:* Enable command is not being issued or revoked.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during the execution of the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.5.5 Function module MC_Reset_MDX/MX



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Application

You can use the function module MC_Reset_MDX/MX on all motor axes.

Description

The function module MC_Reset_MDX/MX is used to acknowledge inverter errors.

Errors that occur in a function module of the `MPLCMotion_MDX/MX` library are not acknowledged by this function module. These errors reset themselves automatically once the cause of the error has been removed.

Input signals

The behavior of the function module MC_Reset_MDX/MX is dependent on the following input signals:

Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to acknowledge inverter errors. When a rising edge occurs at this input signal, the function module resets the inverter error.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

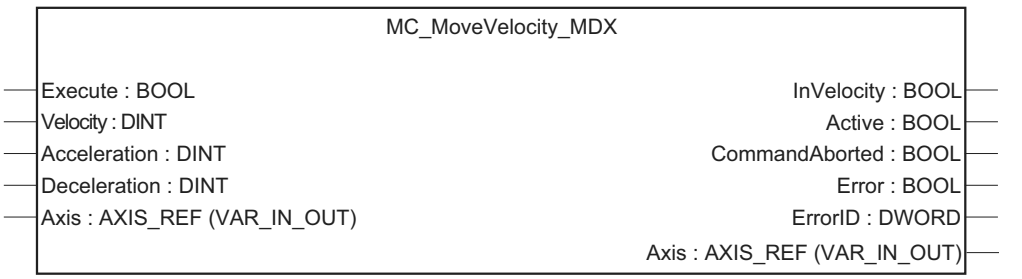
The function module MC_Reset_MDX/MX has the following output signals:

Output	Type	Meaning
Done	BOOL	The output signal *Done* shows whether a reset was executed. • *TRUE*: Reset successful. • *FALSE:* Reset unsuccessful.
Busy	BOOL	The output signal *Busy* shows whether the inverter error has been reset. • *TRUE*: The function module is currently resetting the inverter error. • *FALSE:* The function module is not currently resetting the inverter error.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during the execution of the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.6 MDX/MX_SingleAxis directory

The `MDX/MX_SingleAxis` directory contains function modules that enable motion tasks for a motor axis with encoder.

4.6.1 Function module MC_MoveVelocity_MDX/MX



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Application

You can only use the function module MC_MoveVelocity_MDX/MX on motor axes with encoders.

Prerequisite

For the function module MC_MoveVelocity_MDX to be executed for **MOVIDRIVE® B**, the motor axis must be assigned the status *STANDSTILL* or *CONTINUOUS_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MDX).

For the function module MC_MoveVelocity_MX to be executed for **MOVIAXIS®**, the motor axis must be assigned the status *STANDSTILL,CONTINUOUS_MOTION* or *DISCRETE_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MX).

Description

The function module MC_MoveVelocity_MDX/MX starts continuous rotation of a motor axis.

The input signals *Velocity*, *Acceleration* and *Deceleration* determine the dynamic behavior of the rotation.

Cancellation

The speed control triggered by the function module MC_MoveVelocity_MDX/MX is cancelled by the function modules MC_Stop_MDX/MX and MC_AxisStop_MDX/MX (→ Section 4.1).

Effect

Set the speed window to the target setpoint speed for the output of the signal TRUE at the output *InVelocity* using the following parameters:

- **MOVIDRIVE® B:** in the startup assistant, *P411 Range width* (→ Section "Startup")
- **MOVIAXIS®:** Parameter "PLC library speed window P1" index 10407.1

Input signals

The behavior of the function module MC_MoveVelocity_MDX/MX is dependent on the following input signals:

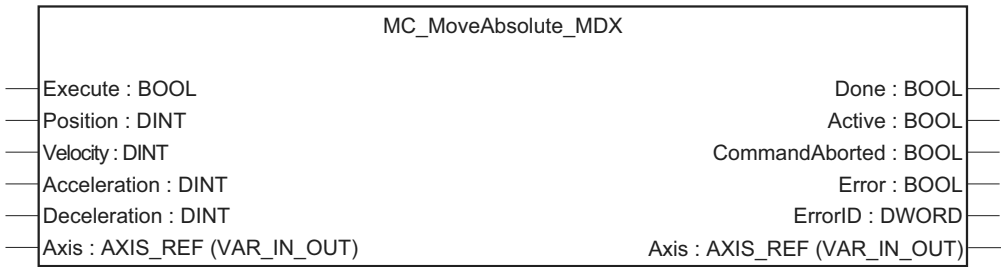
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* starts the task of the function module. When a rising edge occurs at this input signal, the function module starts the speed control.
Velocity	DINT	The input signal *Velocity* specifies the motor speed during the constant speed phase.
Acceleration	DINT	The input signal *Acceleration* specifies the acceleration (increase of kinetic energy in the motor).
Deceleration	DINT	The input signal *Deceleration* specifies the braking deceleration (decrease of kinetic energy in the motor).
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_MoveVelocity_MDX/MX has the following output signals:

Output signal	Type	Meaning
InVelocity	BOOL	The output signal *InVelocity* shows whether the motor axis turns at the target setpoint speed. • *TRUE*: The motor axis turns at the speed specified by the input signal *Velocity*. • *FALSE:* The motor axis is accelerated or decelerated to reach the target setpoint speed.
Active	BOOL	The output signal *Active* shows whether the motor axis is accelerated to reach the setpoint speed. • *TRUE*: The motor axis is accelerated or decelerated. • *FALSE:* The motor axis is not accelerated or decelerated.
Command-Aborted	BOOL	The output signal *CommandAborted* shows whether the task of the function module has been cancelled. • *TRUE*: The task of the function module has been cancelled. • *FALSE:* The task of the function module has not been cancelled.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.6.2 Function module MC_MoveAbsolute_MDX/MX



58163AXX

Application

You can only use the function module MC_MoveAbsolute_MDX/MX on motor axes with encoders.

Prerequisite

- For the function module MC_MoveAbsolute_MDX to be executed for **MOVIDRIVE® B**, the motor axis must be assigned the status *STANDSTILL* or *DISCRETE_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MDX).
- For the function module MC_MoveAbsolute_MX to be executed for **MOVIAXIS®**, the motor axis must be assigned the status *STANDSTILL, DISCRETE_MOTION* or *CONTINUOUS_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MX).
- The axis must also be referenced. Exception for MOVIDRIVE® B: The function module MC_InitialConfig_MDX was first executed with the input signal *UseMoveAbsoluteWithoutReference = TRUE*.

Description

The function module MC_MoveAbsolute_MDX/MX starts the movement of a motor axis to an absolute axis position.

- The input signals *Velocity*, *Acceleration* and *Deceleration* determine the dynamic behavior of the rotation.
- The motor axis remains at the target position subject to position control.

Effect

The following parameters of the **MOVIDRIVE® B** drive inverter have a direct effect on the execution of the function module MC_MoveAbsolute_MDX.

- You can use parameters *P916 Ramp type* and *P933 Jerk time* to define positioning ramps with jerk limitation. Use function module MC_SetJerk_MDX to set these parameters.
- Use parameter *P922 Positioning window* to set the positioning window to the target position, within which the function module sets the output signal *Done* to *TRUE* "Target position reached".

The startup assistant helps you to set these parameters.

The following parameters of the **MOVIAXIS®** servo inverter have a direct effect on the execution of the function module MC_MoveAbsolute_MX.

- Define the jerk for positioning ramps using index 9582.1. Use function module MC_SetJerk_MX to set these parameters.
- Use index 9885.3 to set the positioning window to the target position, within which the function module sets the output signal *Done* to *TRUE* "Target position reached".

Input signals

The behavior of the function module MC_MoveAbsolute_MDX/MX is dependent on the following input signals:

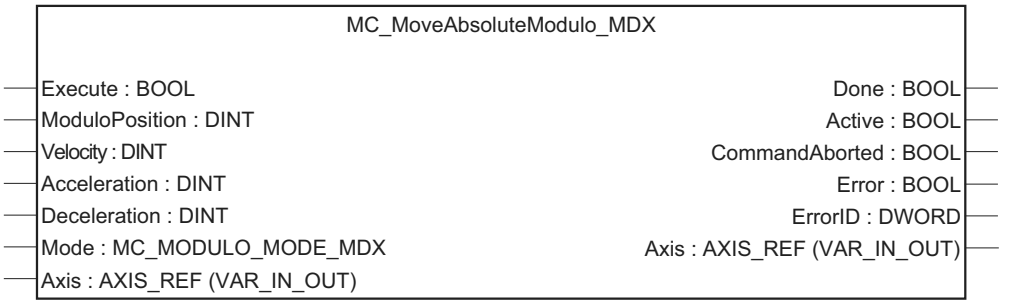
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the motor axis rotation. When a rising edge occurs at this input signal, the function module starts motor axis rotation.
Position	DINT	The input signal *Position* specifies the target position of the motor axis rotation.
Velocity	DINT	The input signal *Velocity* specifies the motor speed during the constant speed phase.
Acceleration	DINT	The input signal *Acceleration* specifies the acceleration (increase of kinetic energy in the motor).
Deceleration	DINT	The input signal *Deceleration* specifies the braking deceleration (decrease of kinetic energy in the motor).
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_MoveAbsolute_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the motor axis has been positioned. • *TRUE*: The motor axis has performed the rotation. The motor axis has reached the target position window. • *FALSE: The motor axis has not completed the rotation. The motor axis has not yet reached the target position window.*
Active	BOOL	The output signal *Active* shows whether the motor axis is turning to reach the target position window. • *TRUE*: The motor axis is rotating. • *FALSE:* The motor axis is not rotating.
Command-Aborted	BOOL	The output signal *CommandAborted* shows whether another function module has cancelled the task of the function module. • *TRUE*: Another function module has cancelled the task of the function module. • *FALSE:* The task of the function module has not been cancelled.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.6.3 Function module MC_MoveAbsoluteModulo_MDX



58164AXX

Application

You can use the function module MC_MoveAbsoluteModulo_MDX only on motor axes with encoders.

Prerequisites

- For the function module MC_MoveAbsoluteModulo_MDX to be executed for **MOVIDRIVE® B**, the motor axis must be assigned the status *STANDSTILL* or *DISCRETE_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MDX).
- The function module MC_SetModuloParameters_MDX must first have been executed for this motor axis.
- The axis must also be referenced. Exception: The function module MC_InitialConfig_MDX was first executed with the input signal *UseMoveAbsoluteWithoutReference = TRUE*.

Description

The function module MC_MoveAbsoluteModulo_MDX starts the movement of a motor axis to an absolute axis position in modulo format. A motor axis rotation of 360° corresponds to 2^{16} increments.

- The input signals *Velocity*, *Acceleration* and *Deceleration* determine the dynamic behavior of the rotation.
- The input signal *Mode* specifies the strategy of the task (short distance, clockwise, counterclockwise).
- The motor axis remains at the target position subject to position control.

For more information on position specification and position management, refer to the "Positioning and sequence control IPOS$^{plus®}$" system manual.

Note:

Set the required gear unit and encoder data using the function module MC_SetModuloParameters_MDX.

Effect

The following parameters of the MOVIDRIVE® MDX60B/61B have a direct effect on the execution of the function module MC_MoveAbsoluteModulo_MDX.

- You can use parameters *P916 Ramp type* and *P933 Jerk time* to define positioning ramps with jerk limitation. Use function module MC_SetJerk_MDX to set these parameters.
- Use parameter *P922 Positioning window* to set the positioning window to the target position, within which the function module sets the output signal *Done* to *TRUE* "Target position reached".

The startup assistant helps you to set these parameters.

Input signals

The behavior of the function module MC_MoveAbsoluteModulo_MDX is dependent on the following input signals:

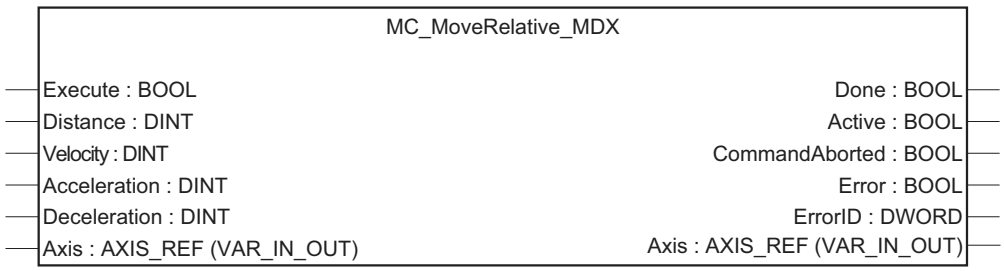
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the motor axis rotation. When a rising edge occurs at this input signal, the function module starts the motor axis rotation.
ModuloPosition	DINT	The input signal *Position* specifies the target position of the motor axis rotation. 2^{16} increments correspond to a motor axis rotation of 360° for MOVIDRIVE® B (unit: modulo increments). The number of complete rotations is specified in the high word and the target angle between 0° and 360° in the low word. The maximum setting range is dependent on the modulo numerator, denominator and encoder resolution.
Velocity	DINT	The input signal *Velocity* specifies the motor speed during the constant speed phase.
Acceleration	DINT	The input signal *Acceleration* specifies the acceleration (increase of kinetic energy in the motor).
Deceleration	DINT	The input signal *Deceleration* specifies the braking deceleration (decrease of kinetic energy in the motor).
Mode	MC_ MODULO_ MODE_MDX	The input signal *Mode* specifies the travel strategy. • MDX_OFF: Modulo functionality deactivated • MDX_SHORT: Short distance • MDX_CW: Clockwise rotation • MDX_CCW: Counterclockwise rotation
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_MoveAbsoluteModulo_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the motor axis has been positioned. • *TRUE*: The motor axis has performed the rotation. The motor axis has reached the target position window. • *FALSE:* The motor axis has not completed the rotation. The motor axis has not yet reached the target position window.
Active	BOOL	The output signal *Active* shows whether the motor axis is turning to reach the target position window. • *TRUE*: The motor axis is rotating. • *FALSE:* The motor axis is not rotating.
Command-Aborted	BOOL	The output signal *CommandAborted* shows whether another function module has cancelled the task of the function module. • *TRUE*: Another function module has cancelled the task of the function module. • *FALSE:* The task of the function module has not been cancelled.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.6.4 Function module MC_MoveRelative_MDX/MX



Application

You can use the function module MC_MoveRelative_MDX/MX on all motor axes with encoders.

Prerequisites

- For the function module MC_MoveRelative_MDX to be executed for **MOVIDRIVE® B,** the motor axis must be assigned the status *STANDSTILL* or *DISCRETE_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MDX).
- For the function module MC_MoveRelative_MX to be executed for **MOVIAXIS®**, the motor axis must be assigned the status *STANDSTILL, DISCRETE_MOTION* or *CONTINUOUS_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MX).

Description

The function module MC_MoveRelative_MDX/MX is used to move the motor axis by a specified distance.

- The input signals *Velocity*, *Acceleration* and *Deceleration* determine the dynamic behavior of the rotation.
- The motor axis remains at the target position subject to position control.

Effect

The following parameters of the **MOVIDRIVE® B** have a direct effect on the execution of the function module MC_MoveRelative_MDX/MX.

- You can use parameters *P916 Ramp type* and *P933 Jerk time* to define positioning ramps with jerk limitation. Use function module MC_SetJerk_MDX/MX to set these parameters.
- Use parameter *P922 Positioning window* to set the positioning window to the target position, within which the function module sets the output signal *Done* to *TRUE* "Target position reached".

The startup assistant helps you to set these parameters.

The following parameters of the **MOVIAXIS®** servo inverter have a direct effect on the execution of the function module MC_MoveAbsolute_MX.

- Define the jerk for positioning ramps using index 9582.1. Use function module MC_SetJerk_MX to set these parameters.
- Use index 9885.3 to set the positioning window to the target position, within which the function module sets the output signal *Done* to *TRUE* "Target position reached".

Input signals

The behavior of the function module MC_MoveRelative_MDX/MX is dependent on the following input signals:

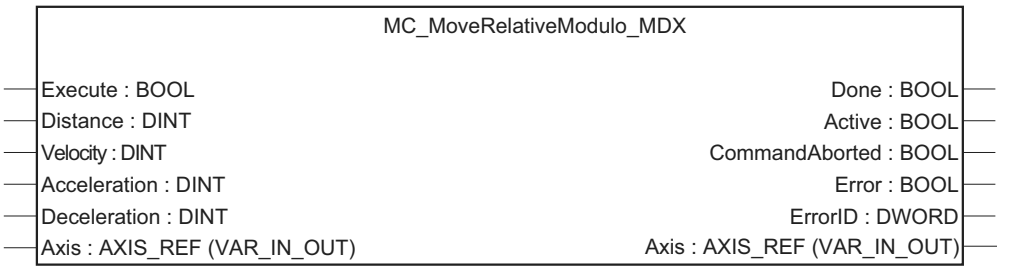
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the motor axis rotation. When a rising edge occurs at this input signal, the function module starts motor axis rotation.
Distance	DINT	The input signal *Distance* specifies the target position of the motor axis rotation as a position relative to the current motor axis position when the function module starts.
Velocity	DINT	The input signal *Velocity* specifies the motor speed during the constant speed phase.
Acceleration	DINT	The input signal *Acceleration* specifies the acceleration (increase of kinetic energy in the motor).
Deceleration	DINT	The input signal *Deceleration* specifies the braking deceleration (decrease of kinetic energy in the motor).
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_MoveRelative_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the motor axis has been positioned. • *TRUE*: The motor axis has performed the rotation. The motor axis has reached the target position window. • *FALSE:* The motor axis has not completed the rotation. The motor axis has not yet reached the target position window.
Active	BOOL	The output signal *Active* shows whether the motor axis is turning to reach the target position window. • *TRUE*: The motor axis is rotating. • *FALSE:* The motor axis is not rotating.
Command-Aborted	BOOL	The output signal *CommandAborted* shows whether another function module has cancelled the task of the function module. • *TRUE*: Another function module has interrupted the task of the function module. • *FALSE:* The task of the function module has not been cancelled.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.6.5 Function module MC_MoveRelativeModulo_MDX



58166AXX

Application

Function module MC_MoveRelativeModulo_MDX

can only be used on motor axes with encoders.

Prerequisites

- For the function module MC_MoveRelativeModulo_MDX to be executed for **MOVIDRIVE® B**, the motor axis must be assigned the status *STANDSTILL* or *DISCRETE_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MDX).
- The function module MC_SetModuloParameters_MDX must first be executed for this motor axis.

Description

The function module MC_MoveRelativeModulo_MDX starts the movement of a motor axis at a specified distance in modulo format.

- The input signals *Velocity*, *Acceleration* and *Deceleration* determine the dynamic behavior of the rotation.
- The motor axis remains at the target position subject to position control.

Note:

Set the required gear unit and encoder data using the function module MC_SetModuloParameters_MDX.

Effect

The following parameters of the MOVIDRIVE® MDX60B/61Bhave a direct effect on the execution of the function module MC_MoveRelative_MDX.

- You can use parameters *P916 Ramp type* and *P933 Jerk time* to define positioning ramps with jerk limitation. Use function module MC_SetJerk_MDX to set these parameters.
- Use parameter *P922 Positioning window* to set the positioning window to the target position, within which the function module sets the output signal *Done* to *TRUE* "Target position reached".

The startup assistant helps you to set these parameters.

Input signals

The behavior of the function module MC_MoveRelativeModulo_MDX is dependent on the following input signals:

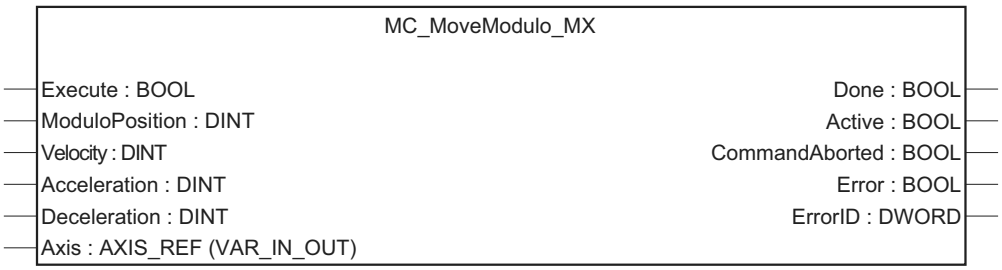
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the motor axis rotation. When a rising edge occurs at this input signal, the function module starts motor axis rotation.
Distance	DINT	The input signal *Distance* specifies the target position of the motor axis rotation as a position relative to the current motor axis position when the function module starts. 2^{16} increments correspond to a motor axis rotation of 360° for MOVIDRIVE® B (unit: modulo increments). The number of complete rotations is specified in the high word and the target angle between 0° and 360° in the low word. The maximum setting range is dependent on the modulo numerator, denominator and encoder resolution.
Velocity	DINT	The input signal *Velocity* specifies the motor speed during the constant speed phase.
Acceleration	DINT	The input signal *Acceleration* specifies the acceleration (increase of kinetic energy in the motor).
Deceleration	DINT	The input signal *Deceleration* specifies the braking deceleration (decrease of kinetic energy in the motor).
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_MoveRelativeModulo_MDX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the motor axis has been positioned. • *TRUE*: The motor axis has performed the rotation. The motor axis has reached the target position window. • *FALSE:* The motor axis has not completed the rotation. The motor axis has not yet reached the target position window.
Active	BOOL	The output signal *Active* shows whether the motor axis is turning to reach the target position window. • *TRUE*: The motor axis is rotating. • *FALSE: The motor axis is not rotating.*
Command-Aborted	BOOL	The output signal *CommandAborted* shows whether another function module has cancelled the task of the function module. • *TRUE*: Another function module has interrupted the task of the function module. • *FALSE:* The task of the function module has not been cancelled.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.6.6 Function module MC_MoveModulo_MX



59601AXX

Application

You can only use the function module MC_MoveModulo_MX on motor axes with encoders.

Prerequisites

- For the function module MC_MoveModulo_MX to be executed, the motor axis must be assigned the status *STANDSTILL,CONTINUOUS_MOTION* or *DISCRETE_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MX).
- The function module MC_SetModuloParameters_MX must first be executed for this motor axis.
- The axis must also be referenced.

Description

The function module MC_MoveModulo_MX starts the movement of a motor axis to an axis position in modulo format.

- The input signals *Velocity*, *Acceleration* and *Deceleration* determine the dynamic behavior of the rotation.
- The motor axis remains at the target position subject to position control.

Note:

Set the required parameters (modulo mode, overflow value, underflow value) using the function module MC_SetModuloParameters_MX.

Effect

The following parameters of the MOVIAXIS® have a direct effect on the execution of the function module MC_MoveModulo_MX.

- Define the jerk for positioning ramps using index 9582.1. Use function module MC_SetJerk_MX to set these parameters.
- Use index 9885.3 to set the positioning window to the target position, within which the function module sets the output signal *Done* to *TRUE* "Target position reached".

Input signals

The behavior of the function module MC_MoveModulo_MX is dependent on the following input signals:

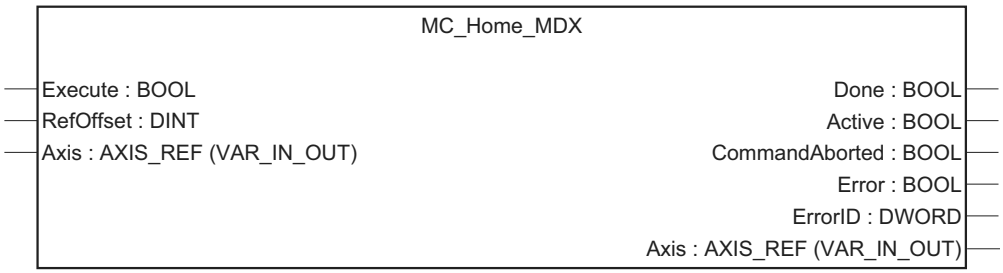
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the motor axis rotation. When a rising edge occurs at this input signal, the function module starts the motor axis rotation.
ModuloPosition	DINT	The input signal *ModuloPosition* specifies the target position of the motor axis rotation in modulo format.
Velocity	DINT	The input signal *Velocity* specifies the motor speed during the constant speed phase.
Acceleration	DINT	The input signal *Acceleration* specifies the acceleration (increase of kinetic energy in the motor).
Deceleration	DINT	The input signal *Deceleration* specifies the braking deceleration (decrease of kinetic energy in the motor).
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_MoveModulo_MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the motor axis has been positioned. • *TRUE*: The motor axis has performed the rotation. The motor axis has reached the target position window. • *FALSE:* The motor axis has not yet completed the rotation. The motor axis has not yet reached the target position window.
Active	BOOL	The output signal *Active* shows whether the motor axis is turning to reach the target position window. • *TRUE*: The motor axis is rotating. • *FALSE:* The motor axis is not rotating.
Command Aborted	BOOL	The output signal *CommandAborted* shows whether another function module has cancelled the task of the function module. • *TRUE*: Another function module has cancelled the task of the function module. • *FALSE:* The task of the function module has not been cancelled.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.6.7 Function module MC_Home_MDX/MX



58167AXX

Application

You can only use the function module MC_Home_MDX/MX on motor axes with encoders.

Prerequisites

For the function module MC_Home_MDX/MX to be executed, the motor axis must be in PLCopenState *STANDSTILL* (output signal of the function module MC_ConnectAxis_MDX).

The axis must also be enabled for all reference travel types. Exception: The axis must not be enabled for reference travel type 8 for MOVIDRIVE® B.

Description

The function module MC_Home_MDX/MX triggers the reference travel of a motor axis.

After reference travel, the function module sets the position of the motor axis to the value specified by the input signal *RefOffset*.

Effect

- **MOVIDRIVE® B:** In the control configuration, set the encoder to be used for reference travel in the module parameters of the inverter. Parameters *P900* to *P904* of the MOVIDRIVE® MDX60B/61B specify the type of reference travel. You can change these parameters using the function module MC_SetHomeParameters_MDX.
- **MOVIAXIS®:** Important reference parameters are set using the function module MC_SetHomeParameters_MX for reference travel with MOVIAXIS®. You can set additional parameters in the parameter tree (FCB12, reference travel) or using the function module MC_WriteParameter_MX.

Input signals

The behavior of the function module MC_Home_MDX/MX is dependent on the following input signals:

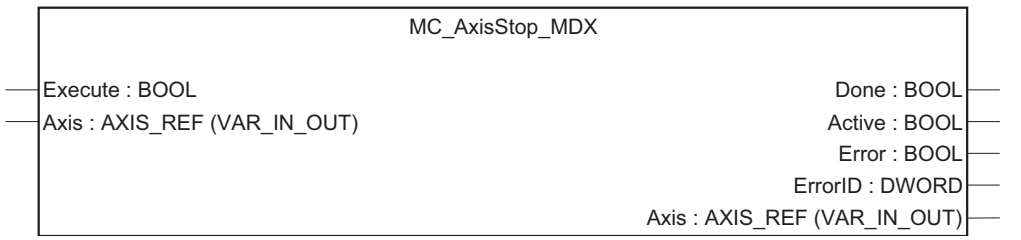
Input signal	Type	Meaning
Execute	BOOL	The input signals *Execute* is used to start the reference travel. When a rising edge occurs at this input signal, the function module starts the reference travel.
RefOffset	DINT	The input signal *RefOffset* specifies the actual position of the motor axis that is set after reference travel.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_Home_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the reference travel of the motor axis has been completed. • *TRUE*: Reference travel of the motor axis is completed. The motor axis is at the position specified by the input signal *RefOffset*. • *FALSE:* Reference travel of the motor axis is not yet complete.
Active	BOOL	The output signal *Active* shows whether the motor axis is performing reference travel. • *TRUE*: The motor axis is performing reference travel. • *FALSE:* The motor axis is not performing reference travel.
Command-Aborted	BOOL	The output signal *CommandAborted* shows whether another function module has cancelled the reference travel. • *TRUE*: Another function module has cancelled reference travel. • *FALSE:* Reference travel has not been cancelled.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.6.8 Function module MC_AxisStop_MDX/MX and MC_Stop_MDX/MX



58168AXX

Application

You can use the function module MC_AxisStop_MDX/MX and MC_Stop_MDX/MX only on motor axes with encoders. You cannot use interpolated movements using the function module MC_Interpolation_MDX/MX during execution.

Description

The function module MC_AxisStop_MDX/MX terminates the current rotation of the motor axis. The motor axis is slowed down with the deceleration specified at the start of the rotational movement (input signal *Deceleration* or the reference travel parameter).

Use the function module MC_AxisStop_MDX/MX to interrupt motor axis rotations during standard processes.

Use function module MC_Stop_MDX/MX to apply the brake on the motor axis with the highest possible deceleration.

Note:

The **MOVIDRIVE® B** display changes to the "A" status (position control) during the braking process.

The **MOVIDRIVE® B** display changes to status "2" before changing to status "A" when the braking process is triggered by MC_Stop_MDX.

The **MOVIAXIS®** display changes to status "14" (emergency stop) during the braking process triggered by the function module MC_Stop_MX. It changes again to the status before the braking process (5 or 9) after reaching standstill.

The **MOVIAXIS®** display does not change when the braking process is triggered by the function module MC_AxisStop_MX, i.e. it remains at 5 or 9.

The brake is not applied when braking using MC_AxisStop_MDX/MX or MC_Stop_MDX/MX. For example, MC_Power_MDX/MX with *Enable = FALSE* must be called if the brake is to be applied (→ Section 4.5.2).

The motor axis remains in the PLCopenState *STOPPING* (output signal of the function module MC_ConnectAxis_MDX/MX) as long as the input signal *Execute* of the function module MC_Stop_MDX/MX or MC_AxisStop_MDX/MX is set to *TRUE.* This means a motion task for a subsequent movement cannot be performed.

To be able to leave the PLCopenState *STOPPING*, the input signal *Execute* of the function module must be reset to *FALSE* in at least one call up of the function module.

You cannot use the function module MC_AxisStop_MDX/MX in synchronous or cam disk mode. If MC_AxisStop_MDX/MX is still executed, the output signal *Error* is set to *TRUE*. You can use MC_Stop_MDX/MX in synchronous or cam disk mode.

Cancellation

The braking movement triggered by the function module MC_AxisStop_MDX/MX **is only cancelled** by the function module MC_Stop_MDX/MX (the input signal *Execute* of the function module MC_AxisStop_MDX/MX must have already been reset to *FALSE*!).

The task of the function module MC_StopMDX/MX is **not cancelled** by a task of different function modules.

Effect

MOVIDRIVE® B: The braking movement triggered by the function module MC_AxisStop_MDX is executed using ramp t11 set in the parameters P130 and P133 of the inverter. The parameters P131/133 are described by the function module MC_MoveVelocity_MDX, MC_MoveTargetSpeed_MDX and MC_SetDynamics_MDX (input signal *Deceleration*).

The braking movement triggered by the function module MC_Stop_MDX is executed using stop ramp t13 of the inverter set in parameter P136 of the inverter.

MOVIAXIS®: The braking movement triggered by the function module MC_Stop_MX is executed using emergency stop ramp set in index 9576.1.

Input signals

The behavior of the function module MC_AxisStop_MDX/MX and MC_Stop_MDX/MX is dependent on the following input signals:

Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the braking process of the motor axis. When a rising edge occurs at this input signal, the function module starts to slow the motor axis.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

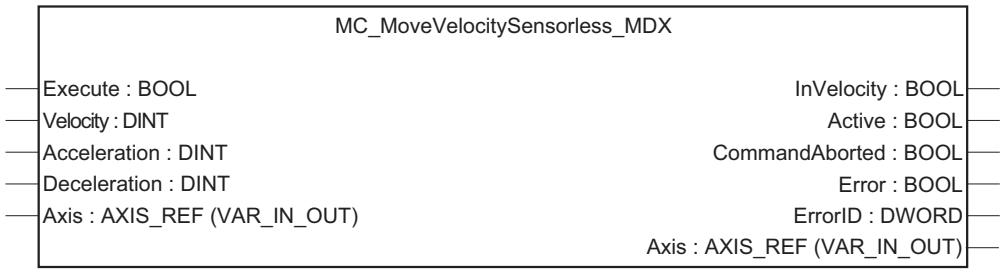
The function module MC_AxisStop_MDX/MX and MC_Stop_MDX/MX issue the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the braking process has been completed on the motor axis. • *TRUE*: The braking process of the motor axis is completed. The motor axis is at standstill (position control when the function module is not cancelled). • *FALSE:* The braking process of the motor axis is not yet complete.
Active	BOOL	The output signal *Active* shows whether the motor axis rotates. • *TRUE*: The motor axis is rotating. • FALSE: The motor axis is not rotating.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.7 MDX_SingleAxisSensorless directory

The `MDX/MX_SingleAxisSensorless` directory contains function modules that enable motion tasks for a motor axis or encoder.

4.7.1 Function module MC_MoveVelocitySensorless_MDX



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Application

You can use the function module MC_MoveVelocitySensorless_MDX only on motor axes without encoders.

Note:

Motor axes without encoders under 15 rpm show a very small maximum torque. Small external forces can cause a considerable deviation from the target speed in this speed range.

Prerequisites

For the function module MC_MoveVelocitySensorless_MDX to be executed, the motor axis must be assigned *STANDSTILL* or *CONTINUOUS_MOTION* or *STOPPING* in PLCopenState (output signal of the function module MC_ConnectAxis_MDX).

Description

The function module MC_MoveVelocitySensorless_MDX triggers continuous rotation of a motor axis without encoder.

The input signals *Velocity*, *Acceleration* and *Deceleration* determine the dynamic behavior of the rotation.

Cancellation

The speed control triggered by the function module MC_MoveVelocitySensorless_MDX is cancelled by the function modules MC_StopSensorless_MDX and MC_AxisStopSensorless_MDX (→ Section 4.1).

Note:

A rising edge at the input of function module MC_Stop_MDX or MC_AxisStop_MDX does not cancel a task of function module MC_MoveVelocitySensorless_MDX, as this function module can only be used for motor axes with encoders.

Effect

Set the speed window for the target setpoint speed for the output of the signal *TRUE* at the output *InVelocity* using the parameter *P411 Range width* in the startup assistant.

Input signals

The behavior of the function module MC_MoveVelocitySensorless_MDX is dependent on the following input signals:

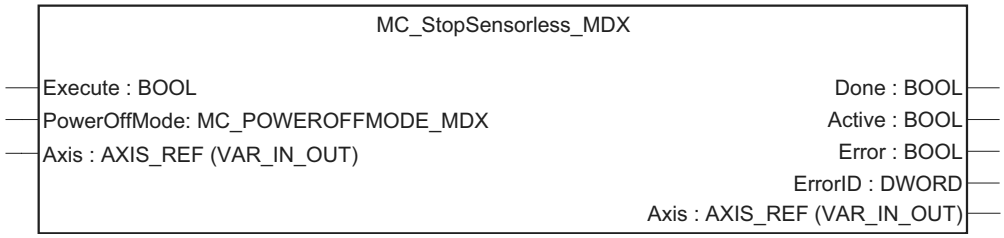
Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* starts the task of the function module. When a rising edge occurs at this input signal, the function module starts the speed control.
Velocity	DINT	The input signal *Velocity* specifies the target setpoint speed of the motor axis rotation. (Unit: rpm, maximum setting range: -6000 ... 6000)
Acceleration	DINT	The input signal *Acceleration* specifies the ramp time for the acceleration to a speed increased by 3000 rpm (increase of kinetic energy in the motor). (Unit: ms, maximum setting range: 0 ... 2000000)
Deceleration	DINT	The input signal *Deceleration* specifies the ramp time for deceleration to a speed lowered by 3000 rpm (reduction of kinetic energy in the motor). (Unit: ms, maximum setting range: 0 ... 2000000)
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_MoveVelocitySensorless_MDX has the following output signals:

Output signal	Type	Meaning
InVelocity	BOOL	The output signal *InVelocity* shows whether the motor axis turns at the target setpoint speed. • *TRUE*: The motor axis turns at the speed specified by the input signal *Velocity*. • *FALSE:* The motor axis is accelerated to reach the target setpoint speed.
Active	BOOL	The output signal *Active* shows whether the motor axis is accelerated to reach the setpoint speed. • *TRUE*: The motor axis is accelerated or decelerated. • *FALSE:* The motor axis is not accelerated or decelerated.
Command-Aborted	BOOL	The output signal *CommandAborted* shows whether the task of the function module has been cancelled. • *TRUE*: The task of the function module has been cancelled. • *FALSE:* The task of the function module has not been cancelled.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.7.2 Function module MC_AxisStopSensorless_MDX and MC_StopSensorless_MDX



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Application

You can use the function module MC_AxisStopSensorless_MDX and MC_StopSenorless_MDX only on motor axes without encoders.

Note:

In the speed control status, motor axes without encoders and with a speed below 15 rpm show a very small maximum torque. In contrast to the use of function module MC_AxisStop_MDX/MX and MC_Stop_MDX/MX, the function modules MC_AxisStopSensorless_MDX and MC_StopSensorless_MDX apply the brake shortly before the motor axis is at standstill so that the motor axis is reliably decelerated until standstill (Input signal *PowerOffMode)*.

Description

The function module MC_AxisStopSensorless_MDX slows the current rotational movement of the motor axis using the ramp t11 (P131, P133) set in the inverter.

The function module MC_StopSensorless_MDX slows the current rotational movement of the motor axis using stop ramp t13 (P136) set in the inverter.

Note:

The motor axis remains in the PLCopenState *STOPPING* (output signal of the function module MC_ConnectAxis_MDX) as long as the input signal *Execute* is set to *TRUE.* This means a motion task for a subsequent movement cannot be performed.

To be able to leave the PLCopenState *STOPPING*, the input signal *Execute* of the function module must be reset to *FALSE* in at least one call up of the function module.

Cancellation

The braking movement triggered by the function modules MC_AxisStopSensorless_MDX or MC_StopSensorless_MDX can be cancelled by the function modules MC_MoveVelocitySensorless_MDX or MC_MoveTargetSpeedSensorless _MDX.

The function module MC_AxisStopSensorless_MDX can also be triggered by the function module MC_StopSenorless_MDX.

The input signal *Execute* of the first active function module must have been executed at least once with the value *FALSE* for both cancellation options.

Effect

The braking movement triggered by the function module MC_AxisStopSensorless_MDX is executed using "ramp t11" set in the parameters P130/ P133. The parameters P131/133 are described by the function modules MC_MoveVelocitySensorless_MDX, MC_MoveTargetSpeedSensorless_MDX and MC_SetDynamics_MDX (input signal *Deceleration*).

The braking movement triggered by the function module MC_StopSensorless_MDX is executed using stop ramp t13 set in parameter P136 of the inverter.

Note:

If a rising edge occurs at the input signal *Execute* or *Enable* of an instance of the function module MC_MoveVelocitySensorless_MDX or MC_MoveTargetSpeedSensorless_MDX, the task of the function module MC_AxisStopSensorless_MDX or MC_StopSensorless_MDX is cancelled when the input signal *Execute* of the function module MC_AxisStopSensorless_MDX or MC_StopSensorless_MDX is no longer set to *TRUE*.

This difference in behavior of the function modules MC_Stop_MDX/MX and MC_AxisStop_MDX/MX for motor axes with encoders is due to the fact that:

For motor axes **without** an encoder, you have to use the function module MC_AxisStopSensorless_MDX or MC_StopSensorless_MDX to reliably slow the motor axis until it comes to a standstill. For motor axes **with** encoders, you can also use the function module MC_MoveVelocity_MDX/MX (input signal *Velocity* = "0").

However, it should be possible to change the speed smoothly from zero to a different speed during a controlled speed change for motor axes both with and without encoders.

Input signals

The behavior of the function module MC_AxisStopSensorless_MDX and MC_StopSensorless_MDX is dependent on the following input signals:

Input signal	Type	Meaning
Execute	BOOL	The input signal *Execute* is used to start the braking process of the motor axis. When a rising edge occurs at this input signal, the function module starts to slow the motor axis.
PowerOffMode	MC_POWEROFFMODE_MDX	The input signal *PowerOffMode* is used to set the status of inverter when it is switched off using the function module MC_StopSensorless_MDX. • *MDX_CTRL_INHIBIT*: The inverter changes to the state "Controller inhibit" (-> InverterStatus 1). The motor brake is applied. If no brake is installed, the motor will coast to a halt. • *MDX_NO_ENABLE*: The inverter changes to the state "No enable" (-> InverterStatus 2). The motor is controlled and slowed down. Parameter *P730* determines whether the motor brake is activated in InverterStauts 2.The brake function is activated in the basic settings, i.e. the brake is activated shortly before reaching standstill (the brake is always activated in InverterStatus 1).
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

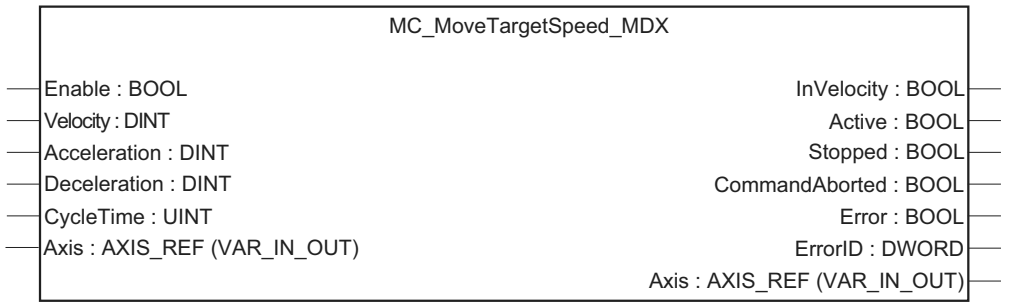
The function module MC_AxisStopSensorless_MDX and MC_StopSensorless_MDX issue the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the braking process has been completed on the motor axis. • *TRUE*: The braking process of the motor axis is completed. The motor axis is at a standstill (status of motor axis: "no enable" or "controller inhibit", depending on the input signal *PowerOffMode*). • *FALSE:* The braking process of the motor axis is not complete.
Active	BOOL	The output signal *Active* shows whether the motor axis rotates. • *TRUE*: The motor axis is rotating. • *FALSE:* The motor axis is not rotating.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.8 MDX/MX_SingleAxisSEW directory

The MDX/MX_SingleAxisSEW directory contains function modules that enable motion tasks for a motor axis and are activated using the input signal *Enable*. The function modules with the additional *Sensorless* name enable motion tasks for a motor axis without encoder and the others for a motor axis with encoder.

4.8.1 Function module MC_MoveTergetSpeed_MDX/MX



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Application

You can use the function module MC_MoveTargetSpeed_MDX/MX only on motor axes with encoders.

Prerequisites

- For the function module MC_MoveTargetSpeed_MDX to be executed for **MOVIDRIVE® B**, the motor axis must be assigned the status *STANDSTILL* or *CONTINUOUS_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MDX).
- For the function module MC_MoveTargetSpeed_MX to be executed for **MOVIAXIS®**, the motor axis must be assigned the status *STANDSTILL, DISCRETE_MOTION* or *CONTINUOUS_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MX).

Description

The function module MC_MoveTargetSpeed_MDX/MX executes continuous rotation of a motor axis when the input signal *Enable* is set to *TRUE*. The function module issues the signal TRUE at the *Error* output as long as the requirements are not met. In contrast to the function module MC_MoveVelocity_MDX/MX, a rising edge is not needed after the requirements are met when using function module MC_MoveTargetSpeed_MDX/MX. The signal *TRUE* at the input *Enable* is sufficient for the rotary motion to start.

In contrast to the execution of function modules MC_Stop_MDX/MX or MC_AxisStop_MDX/MX, the motor axis remains in the PLCopenState *CONTINUOUS_MOTION* during a brake movement triggered by a falling edge at the input signal *Enable.*

Effect

Set the speed window to the target setpoint speed for the output of the signal TRUE at the output *InVelocity* using the following parameters:

- MOVIDRIVE® B: in the startup assistant, *P411 Range width* (→ Section "Startup")
- MOVIAXIS®: Parameter "PLC library speed window P1" index 10407.1

Input signals

The behavior of the function module MC_MoveTargetSpeed_MDX/MX is dependent on the following input signals:

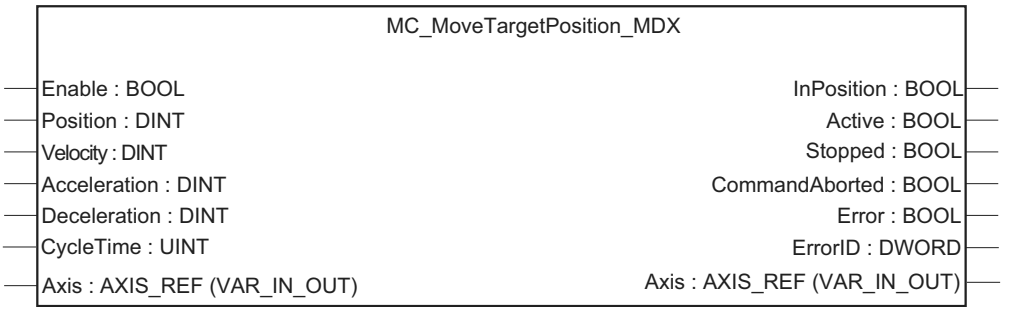
Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module. The task of the function module for movement with the target speed (input signal *Velocity*) is only executed when the input signal *Enable* input is set to *TRUE*. When a falling edge is at the input signal *Enable*, the axis is decelerated until standstill with the braking deceleration that is applied at the input signal *Deceleration* for the falling edge of the input signal *Enable*. The input signal *Axis* is adopted when a rising edge occurs at the input signal *Enable* (or after meeting the requirements for the execution of the function module). All other input signals are read with the input signal *Enable = TRUE* for each call up and adopted according to the input signal *CycleTime*.
Velocity	DINT	The input signal *Velocity* specifies the motor speed during the constant speed phase.
Acceleration	DINT	The input signal *Acceleration* specifies the acceleration (increase of kinetic energy in the motor).
Deceleration	DINT	The input signal *Deceleration* specifies the braking deceleration (decrease of kinetic energy in the motor).
CycleTime	TIME	Minimal cycle time in which the values *Velocity*, *Acceleration* and *Deceleration* are transferred to the inverter. The values are only transferred when a change is made. The resulting bus load can be reduced and specified using the input signal *CycleTime*.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_MoveTargetSpeed_MDX/MX has the following output signals:

Output signal	Type	Meaning
InVelocity	BOOL	The output signal *InVelocity* shows whether the motor axis turns at the target setpoint speed. • *TRUE*: The motor axis turns at the speed specified by the input signal *Velocity*. • *FALSE:* The motor axis is accelerated or decelerated to reach the target setpoint speed.
Active	BOOL	The output signal *Active* shows whether the motor axis is – Accelerated or decelerated to reach the setpoint speed – Baked because the input signal *Enable = FALSE* • *TRUE*: The motor axis is accelerated or decelerated. • *FALSE:* The motor axis is not accelerated or decelerated.
Stopped	BOOL	The motor axis was decelerated and is in the PLCopenState *STAND-STILL*.
Command-Aborted	BOOL	The output signal *CommandAborted* shows whether the task of the function module has been cancelled. This includes the motion to reach or move at the target speed as well as the braking movement triggered when the input signal *Enable* is removed. • *TRUE*: The task of the function module has been cancelled. • *FALSE:* The task of the function module has not been cancelled. A cancelled task requires a new rising edge at the input signal *Enable* for the execution of motion tasks. For example, the removal of the input signal *Enable* after a function module cancellation does not cause a braking movement.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.8.2 Function module MC_MoveTargetPosition_MDX/MX



Application

You can use the function module MC_MoveTargetPosition_MDX/MX only on motor axes with encoders.

Prerequisites

- For the function module MC_MoveTargetPosition_MDX to be executed for **MOVIDRIVE® B**, the motor axis must be assigned the status *STANDSTILL* or *DISCRETE_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MDX).
- For the function module MC_MoveTargetPosition_MX to be executed for **MOVIAXIS®**, the motor axis must be assigned the status *STANDSTILL, DISCRETE_MOTION* or *CONTINUOUS_MOTION* in PLCopenState (output signal of the function module MC_ConnectAxis_MX).

The motor axis must not be referenced. Relative movements can be implemented by linking with the current axis position (output signal *InverterData ActualPosition* of the function module MC_ConnectAxis_MDX/MX).

This can lead to unforeseeable movements for motor axes that are not referenced when the function module is used for absolute positioning.

Description

The function module MC_MoveTargetPosition_MDX/MX activates the movement of a motor axis for the axle position at the input *Position* when the input signal *Enable* is set to *TRUE*. The function module issues the signal TRUE at the *Error* output as long as the requirements are not met. In contrast to the function module MC_MoveAbsolute_MDX/MX, a rising edge is not needed after the requirements are met when using function module MC_MoveTargetPosition_MDX/MX. The signal *TRUE* at the input *Enable* is sufficient for the motor axis positioning to start.

In contrast to the execution of function modules MC_Stop_MDX/MX or MC_AxisStop_MDX/MX, the motor axis remains in the PLCopenState *DISCRETE_MOTION* during a brake movement triggered by a falling edge at the input signal *Enable.*

Effect

The following parameters of the **MOVIDRIVE® B** inverter have a direct effect on the execution of the function module MC_MoveTargetPosition_MDX/MX:

- You can use parameters *P916 Ramp type* and *P933 Jerk time* to define positioning ramps with jerk limitation. Use function module MC_SetJerk_MDX/MX to set these parameters.
- Use parameter *P922 Positioning window* to set the positioning window to the target position, within which the function module sets the output signal *Done* to *TRUE* ("Target position reached").

The startup assistant helps you to set the parameters.

The following parameters of the **MOVIAXIS®** servo inverter have a direct effect on the execution of the function module MC_MoveTargetPosition_MX.

- Define the jerk for positioning ramps using index 9582.1. Use function module MC_SetJerk_MX to set these parameters.
- Use index 9885.3 to set the positioning window to the target position, within which the function module sets the output signal *Done* to *TRUE* "Target position reached".

Input signals

The behavior of the function module MC_MoveTargetPosition_MDX/MX is dependent on the following input signals:

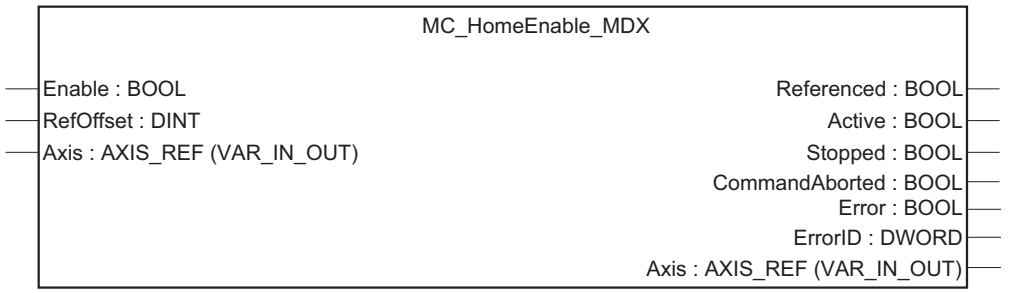
Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module. The task of the function module for reaching the target position (input signal *Position*) is only executed when the input signal *Enable* is set to *TRUE*. When a falling edge is at the input signal *Enable*, the axis is decelerated until standstill with the braking deceleration that is applied at the input signal *Deceleration* for the falling edge of the input signal *Enable*. The input signal *Axis* is adopted when a rising edge occurs at the input signal *Enable* (or after meeting the requirements for the execution of the function module). All other input signals are read with the input signal *Enable = TRUE* for each call up of the function module and adopted according to the input signal *CycleTime*.
Position	DINT	The input signal *Position* specifies the target position of the motor axis rotation.
Velocity	DINT	The input signal *Velocity* specifies the motor speed during the constant speed phase.
Acceleration	DINT	The input signal *Acceleration* specifies the acceleration (increase of kinetic energy in the motor).
Deceleration	DINT	The input signal *Deceleration* specifies the braking deceleration (decrease of kinetic energy in the motor).
CycleTime	TIME	Minimal cycle time in which the values *Position*, *Acceleration* and *Deceleration* are transferred to the inverter. The values are only transferred when a change is made. The resulting bus load can be reduced and specified using the input signal *CycleTime*.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_MoveTargetPosition_MDX/MX has the following output signals:

Output signal	Type	Meaning
InPosition	BOOL	The output signal *InPosition* shows whether the motor axis has been positioned. • *TRUE*: The motor axis has performed the rotation. The motor axis is in the target position window. As long as the signal *TRUE* is assigned to input *Enable*, this output signal is then exactly set when the axis is in the target position window. For example, when moving out of the target window due to external forces, the output signal can be reset accordingly and set again when the target position window is reached once more. • *FALSE:* The motor axis has not yet completed the rotation. The motor axis is not in the target position window.
Active	BOOL	The output signal *Active* shows whether the motor axis is rotating to reach the target position window or whether the brake is being applied due to a falling edge at the input signal *Enable*. • *TRUE*: The motor axis is rotating. • *FALSE:* The motor axis is not rotating.
Stopped	BOOL	The motor axis was decelerated and is in the PLCopenState *Standstill*.
Command-Aborted	BOOL	The output signal *CommandAborted* shows whether the task of the function module has been cancelled. This includes the movement to the target position as well as the braking movement triggered when the input signal *Enable* is removed. • *TRUE*: The task of the function module has been cancelled. • *FALSE:* The task of the function module has not been cancelled. A cancelled task requires a new rising edge at the input signal *Enable* for the execution of motion tasks. For example, the removal of the input signal *Enable* after a function module cancellation does not cause a braking movement.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.8.3 Function module MC_HomeEnable_MDX/MX



Application

You can only use the function module MC_HomeEnable_MDX/MX on motor axes with encoders.

Prerequisites

For the function module MC_HomeEnable_MDX/MX to be executed, the motor axis must be in PLCopenState *Standstill* (output signal of the function module MC_ConnectAxis_MDX/MX). The axis must also be enabled for all reference travel types (except type 8).

Description

The function module MC_HomeEnable_MDX/MX starts the reference travel of a motor axis when the input signal *Enable* is set to *TRUE*. The function module issues the signal *TRUE* at the *Error* output as long as the requirements are not met. In contrast to the function module MC_Home_MDX/MX, a rising edge is not needed after the requirements are met when using function module MC_HomeEnable_MDX/MX. The signal *TRUE* at the input *Enable* is sufficient for the reference travel of the motor axis to start.

After reference travel, the function module sets the position of the motor axis to the value specified by the input signal *RefOffset*.

In contrast to the execution of function modules MC_Stop_MDX/MX or MC_AxisStop_MDX/MX, the motor axis remains in the PLCopenState *HOMING* during a brake movement triggered by a falling edge at the input signal *Enable.*

Effect

- **MOVIDRIVE® B:** In the control configuration, set the encoder to be used for reference travel in the module parameters of the inverter / servo inverter. Parameters *P900* to *P904* of the MOVIDRIVE® MDX60B/61B specify the type of reference travel. You can change these parameters using the function module MC_SetHomeParameters_MDX.

  The braking movement due to a falling edge at input signal Enable is executed using the stop ramp set in parameter P136 of the inverter. The startup assistant helps you to set the parameters.
- **MOVIAXIS®:** Important reference parameters are set using the function module MC_SetHomeParameters_MX for reference travel with MOVIAXIS®. You can set additional parameters in the parameter tree (FCB12, reference travel) or using the function module MC_WriteParameter_MX.

Input signals

The behavior of the function module MC_HomeEnable_MDX/MX is dependent on the following input signals:

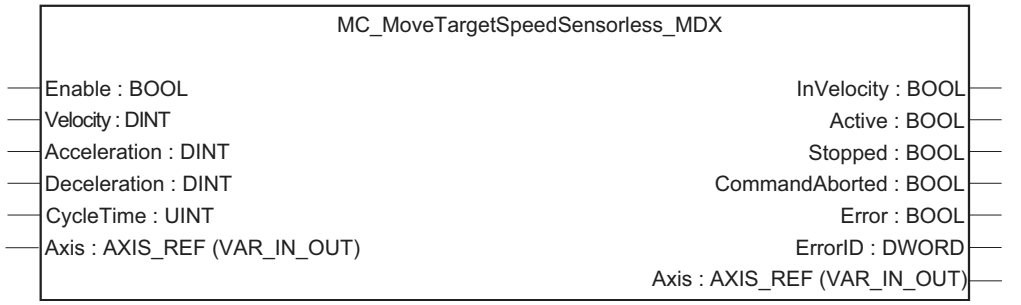
Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module. The task of the function module for executing the reference travel is only executed when the input signal *Enable* input is set to *TRUE*. When a falling edge is at the input signal *Enable*, the axis is decelerated until standstill with the (emergency) stop ramp (MOVIDRIVE® B: P136 Stop ramp t13; MOVIAXIS®: Emergency stop ramp, index 9576.1). The input signals *Axis* and *RefOffset* are adopted for a rising edge occurs at the input signal *Enable* (or after meeting the requirements for the execution of the function module).
RefOffset	DINT	The input signal *RefOffset* specifies the actual position of the motor axis that is set after reference travel.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_HomeEnable_MDX/MX has the following output signals:

Output signal	Type	Meaning
Referenced	BOOL	The output signal *Done* shows whether the reference travel of the motor axis has been completed. • *TRUE*: Reference travel of the motor axis is completed. The motor axis is at the position specified by the input signal *RefOffset.* • *FALSE:* Reference travel of the motor axis is not yet complete.
Active	BOOL	The output signal *Active* shows whether the motor axis is performing reference travel. • *TRUE*: The motor axis is performing reference travel. • *FALSE:* The motor axis is not performing reference travel.
Stopped	BOOL	The motor axis was decelerated and is in the PLCopenState *STANDSTILL*.
CommandAborted	BOOL	The output signal *CommandAborted* shows whether another function module has cancelled the reference travel. • *TRUE*: Another function module has cancelled reference travel. • *FALSE:* Reference travel has not been cancelled.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.8.4 Function module MC_MoveTargetSpeedSensorless_MDX



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Application

You can use the function module MC_MoveTargetSpeedSensorless_MDX only on motor axes without encoders.

Prerequisites

For the function module MC_MoveTargetSpeedSensorless_MDX to be executed, the motor axis must be assigned *STANDSTILL* or *CONTINUOUS_MOTION* or *STOPPING* in PLCopenState (output signal of the function module MC_ConnectAxis_MDX).

Description

The function module MC_MoveTargetSpeedSensorless_MDX executes continuous rotation of a motor axis when the input signal *Enable* is set to *TRUE*. The function module issues the signal *TRUE* at the *Error* output as long as the requirements are not met. In contrast to the function module MC_MoveVelocitySensorless_MDX, a rising edge is not needed after the requirements are met when using function module MC_MoveTargetSpeedSensorless_MDX. The signal *TRUE* at the input *Enable* is sufficient for the rotary motion to start.

- In the speed control status, motor axes without encoders can only be operated at speeds under 15 rpm with a very small maximum torque.
- In contrast to the execution of function modules MC_StopSensorless_MDX or MC_AxisStopSensorless_MDX, the motor axis remains in the PLCopenState *CONTINUOUS_MOTION* during a brake movement triggered by a falling edge at the input signal *Enable.*

Input signals

The behavior of the function module MC_MoveTargetSpeedSensorless_MDX is dependent on the following input signals:

Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module. The task of the function module for movement with the target speed (input signal *Velocity*) is only executed when the input signal *Enable* input is set to *TRUE*. When a falling edge is at the input signal *Enable*, the axis is decelerated until standstill with the braking deceleration that is applied at the input signal *Deceleration* for the falling edge of the input signal *Enable*. The input signal *Axis* is adopted when a rising edge occurs at the input signal *Enable* (or after meeting the requirements for the execution of the function module). All other input signals are read with the input signal *Enable = TRUE* for each call up of the function module and adopted according to the input signal *CycleTime*.
Velocity	DINT	The input signal *Velocity* specifies the target setpoint speed of the motor axis rotation. (Unit: rpm, maximum setting range: -6000 ... 6000)
Acceleration	DINT	The input signal *Acceleration* specifies the ramp time for the acceleration to a speed increased by 3000 rpm (increase of kinetic energy in the motor). (Unit: ms, maximum setting range: 0 ... 2000000)
Deceleration	DINT	The input signal *Deceleration* specifies the ramp time for deceleration to a speed lowered by 3000 rpm (reduction of kinetic energy in the motor). (Unit: ms, maximum setting range: 0 ... 2000000)
CycleTime	TIME	Minimal cycle time in which the values *Velocity*, *Acceleration* and *Deceleration* are transferred to the inverter. The values are only transferred when a change is made. The resulting bus load can be reduced and specified using the input signal *CycleTime*.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

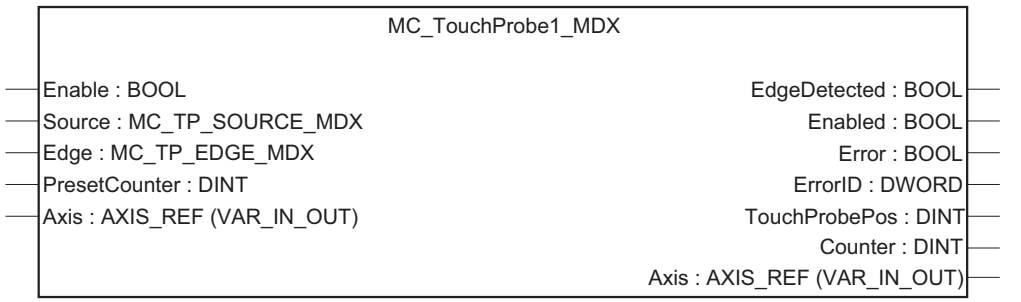
Output signals

The function module MC_MoveTargetSpeedSenorless_MDX has the following output signals:

Output signal	Type	Meaning
InVelocity	BOOL	The output signal *InVelocity* shows whether the motor axis rotates with the setpoint speed (→ Setting the speed window to the setpoint speed in the startup assistant, see section "Startup", P411 *Range width*). • *TRUE*: The motor axis turns at the speed specified by the input signal *Velocity*. • *FALSE:* The motor axis is accelerated to reach the setpoint speed.
Active	BOOL	The output signal *Active* shows whether the motor axis is – Accelerated or decelerated to reach the target setpoint speed – Braked – Braked because the input signal *Enable = FALSE* • *TRUE*: The motor axis is accelerated or decelerated. • *FALSE:* The motor axis is not accelerated or decelerated.
Stopped	BOOL	The motor axis was decelerated and is in the PLCopenState *Standstill*.
Command-Aborted	BOOL	The output signal *CommandAborted* shows whether the task of the function module has been cancelled. This includes the motion to reach or move at the setpoint speed as well as the braking movement triggered when the input signal *Enable* is removed. • *TRUE*: The task of the function module has been cancelled. • *FALSE:* The task of the function module has not been cancelled. A cancelled task requires a new rising edge at the input signal *Enable* for the execution of motion tasks. For example, the removal of the input signal *Enable* after a function module cancellation does not cause a braking movement.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").

4.9 MDX/MX_Supplements directory

4.9.1 Function module MC_TouchProbe.._MDX/MX



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Application You can use the function module MC_TouchProbe_MDX/MX on all motor axes.

Description **MOVIDRIVE® B** has two interrupt-capable binary inputs DI02 and DI03.

MOVIAXIS® has eight interrupt-capable binary inputs DI01 to DI08.

If an interrupt event (the edge change is specified by the input signal *Edge*) is triggered at one of these binary outputs, the corresponding function module MC_TouchProbe.._MDX/MX outputs the actual position of the selected encoder via the output signal *TouchProbePos* (specified by the input signal *Source*) and also increments the output signal *Counter* by one.

There is a fixed assignment between binary input and function module for **MOVIDRIVE B®**:

- DI02 MC_TouchProbe1_MDX
- DI03 MC_TouchProbe2_MDX

Up to four touch probe instances can be executed simultaneously for **MOVIAXIS®**. Specify the interrupt source of each instance using the input *InterruptSource* of the function module MC_TouchProbe_MX.

Ensure that the motor axis is assigned the status *STANDSTILL* (output signal of the function module MC_ConnectAxis_MDX/MX) in the PLCopenState when calling up the function module MC_TouchProbe.._MDX/MX for the first time.

The output signal *Enabled = TRUE* shows that the initialization of the function module is complete and the input signal *TouchProbe* was activated.

At least 5 control cycles must be performed between 2 interrupt events. The time intervals between two interrupt events must not be under approx. 40 seconds so that all interrupt events are detected reliably.

The *InterruptSource* input is only available for the function module MC_TouchProbe_MX for **MOVIAXIS®**.

TouchProbe routine

1. Initialization
   - The function module MC_TouchProbe.._MDX/MX is called up by setting the *Enable* input signal to *TRUE*. The inverter is initialized with the values at the other inputs of the function module and starts a touch probe interrupt routine.
   - The function module MC_TouchProbe.._MDX/MX sets the output signal *Enabled* to *TRUE*.
2. The touch probe event has occurred.
   - The function module MC_TouchProbe.._MDX/MX sets the output signal *EdgeDetected* to *TRUE*.
   - The function module MC_TouchProbe.._MDX/MX outputs the touch probe position of the selected encoder system at the output signal *TouchProbePos*.
   - The function module MC_TouchProbe..MDX/MX increases the value of the output signal *Counter* by one.
   - Monitoring of the binary output *TouchProbe* is restarted in the next control cycle. The output signal *EdgeDetected* is set to *FALSE*.

Input signals

The behavior of the function module MC_TouchProbe_MDX/MX is dependent on the following input signals:

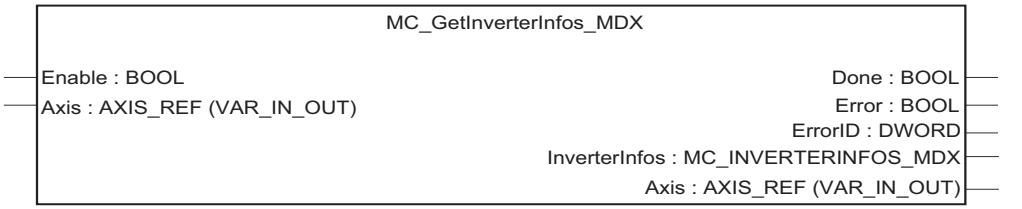
Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module MC_TouchProbe.._MDX/MX. The function module is only executed when the input signal *Enable* is set to *TRUE*. The values of other input signals of the function module are only read when a rising edge occurs at the input signal *Enable*.
Source	MC_TP_ SOURCE _MDX	The input signal *TouchProbeSource* specifies the encoder system. This setting is made independent of the setting in the control configuration. • *MDX_X15*: A motor encoder measures the position. • *MDX_X14:* An external encoder measures the position. • *MDX_SSI:* An absolute encoder measures the position (DIP11B option).
InterruptSource (Only for MOVIAXIS)	MC_TP_ IR_SOURCE _MX	The input signal *InterruptSource* specifies interrupt source: • *MX_TP_DI01*: DI01 • .... • *MX_TP_DI08: DI08*
Edge	MC_TP_ EDGE_MDX	The input signal *Edge* defines the edge evaluation of the touch probe input: • *MDX_EN:* Both edges • *MDX_EN_HI:* Rising edge • *MDX_EN_LO:* Falling edge
PresetCounter	DINT	The input signal *PresetCounter* specifies the initial value of the output signal *Counter*.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_TouchProbe_MDX/MX has the following output signals:

Output signal	Type	Meaning
EdgeDetected	BOOL	The output signal *EdgeDetected* shows whether a touch probe interrupt event has taken place. • *TRUE*: Touch probe event has taken place. • *FALSE*: The output signal *EdgeDetected* is set automatically to *FALSE* after each control cycle.
Enabled	BOOL	The output signal *Enabled* shows whether the function module is active. • *TRUE*: The input signal *Enable* is set to *TRUE.* • *FALSE:* The input signal *Enable* is set to *FALSE.*
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of an error that occurred (→ Section "Error identifier").
TouchProbePos	DINT	The output signal *TouchProbePos* shows the touch probe position of the selected encoder system.
Counter	DINT	The output signal *Counter* shows the number of touch probe interrupt events that have occurred.

4.9.2 Function module MC_GetInverterInfos_MDX/MX



Application

You can use the function module MC_GetInverterInfos_MDX/MX on all motor axes.

Description

The function module MC_GetInverterInfos_MDX/MX shows settings of the inverter at the *InverterInfos* output.

The data of the output signal *InverterInfos* is **not** read by the inverter. The data corresponds to the known settings in the MOVI-PLC® control. If you change the inverter parameters **contrary to the warning notes** in section 3.3 and 3.4, this can lead to unforeseeable operating states and differences between the data of the output signal *InverterInfos* and the actual settings in the inverter.

Input signals

The behavior of the function module MC_GetInverterInfos_MDX/MX is dependent on the following input signals:

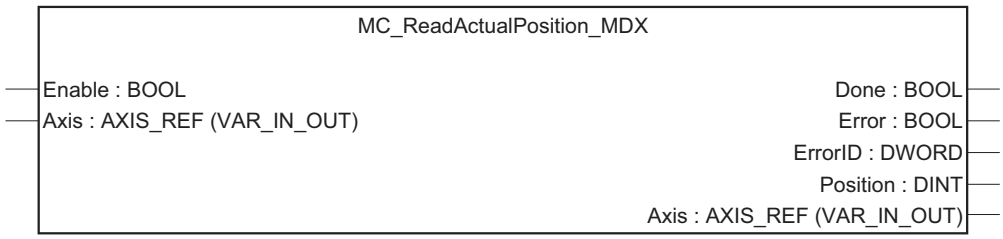
Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module MC_GetInverterInfos_MDX/MX.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_GetInverterInfos_MDX/MX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the data at the output *InverterInfos* is valid. • *TRUE*: The data of the output signal *InverterInfos* is valid (if known in MOVI-PLC®). • *FALSE:* The data of the output signal *InverterInfos* is not valid.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred in the function module. • *FALSE:* No errors have occurred in the function module.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").
InverterInfos	MC_INVERTER-INFOS_MDX (Only for MOVIDRIVE® B) MC_INVERTER-INFOS_MX (Only for MOVIAXIS®)	The output signal *InverterInfos* shows inverter information as it is recorded in the MOVI-PLC® control. (see note in section "Description"). MOVIDRIVE® B: • *TechnologyFunction:* Technology function, P78 (not to be confused with the application version of MOVI-PLC®): – 0: Standard – 1: Electronic cam – 2: Internal synchronous operation • *InverterType:* Operating mode, P700 • *RampType:* Ramp type, P916 • *ModuloMode:* Modulo function, P960 • *PositionWindow:* Position window, P922 • *SpeedWindow:* Speed window range width P411 • *SoftwareLimitSwitchCCW:* Left software limit switch, P921 • *SoftwareLimitSwitchCW:* Right software limit switch, P920 • *InterruptEdgeDI02*: Interrupt mode DI02: – MDX_NOT_ENABLED – MDX_EN: Both edges – MDX_EN_HI: Rising edge – MDX_EN_LO: Falling edge • *InterruptEdgeDI03*: Interrupt mode DI03, see *InterruptEdgeDI02* MOVIAXIS®: see MC_INVERTERINFOS_MX

4.9.3 Function module MC_ReadActualPosition_MDX



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Application

You can use the function module MC_ReadActualPosition_MDX on all motor axes. If the encoder system set in the control configuration is not connected to the drive inverter (for example, motor encoder X15 for axes without encoders), the output signal *Position* has the value "0".

Description

The function module MC_ReadActualPosition_MDX is used to read in the current position of the motor axis that is detected by the encoder system used. The encoder system used is specified in the control configuration for the module parameters of the drive inverter.

Input signals

The behavior of the function module MC_ReadActualPosition_MDX is dependent on the following input signals:

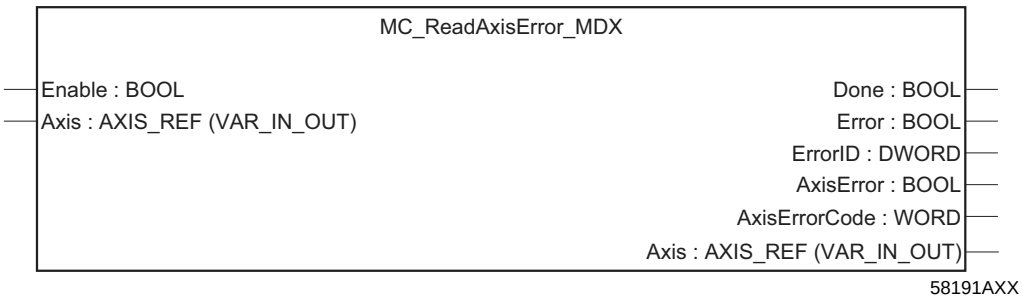
Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module. The task of the function module is only executed when the input signal *Enable* is set to *TRUE*.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_ReadActualPosition_MDX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the motor axis position was correctly transferred. • *TRUE*: The value of the motor axis position of the output signal *Position* is valid. • *FALSE:* The motor axis position has not been transferred.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred during the transfer of the motor axis position. • *FALSE:* No error has occurred.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").
Position	DINT	The output signal *Position* contains the transferred motor axis position.

4.9.4 Function module MC_ReadAxisError_MDX



Application

You can use the function module MC_ReadAxisError_MDX on all motor axes.

Description

The function module MC_ReadAxisError_MDX is used to read in the current error code of the motor axis from the drive inverter to the MOVI-PLC® control.

Input signals

The behavior of the function module MC_ReadAxisError_MDX is dependent on the following input signals:

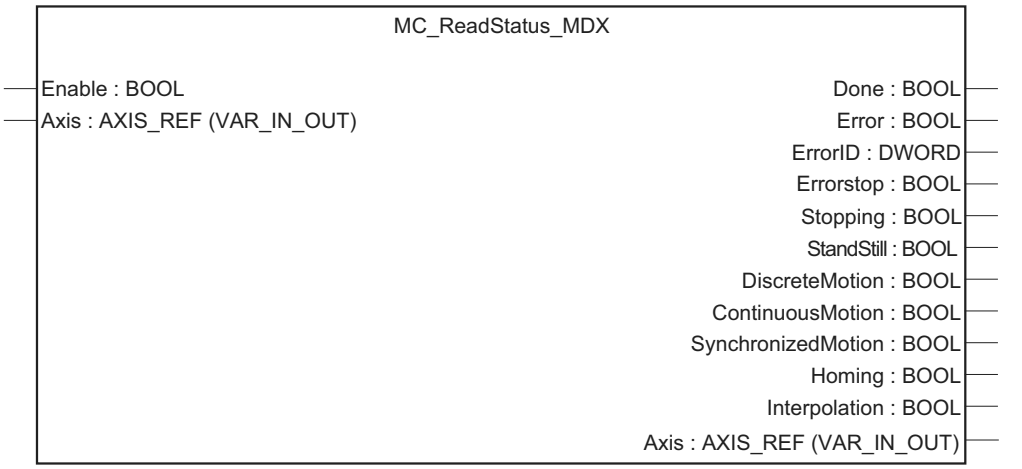
Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module. The task of the function module is only executed when this input signal *Enable* is set to *TRUE*.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_ReadAxisError_MDX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the error code was correctly transferred. • *TRUE*: The value of the error code at the output signal is valid. • *FALSE:* The error code has not been transferred.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error has occurred while the error code was being transferred. • *FALSE:* No error has occurred.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").
AxisError	BOOL	The output signal *AxisError* shows whether the drive inverter has detected an error. • *TRUE*: The drive inverter has detected an error. • *FALSE:* No error has occurred.
AxisErrorCode	WORD	The output signal *AxisErrorCode* contains the error code transferred (corresponds to output signal *InverterData* → FaultStatus of the function module MC_ConnectAxis_MDX/MX).

4.9.5 Function module MC_ReadStatus_MDX



Application You can use the function module MC_ReadStatus_MDX on all motor axes.

Description The function module MC_ReadStatus_MDX is used to read in the PLCopenState of the motor axis from the drive inverter to the MOVI-PLC® control.

Input signals The behavior of the function module MC_ReadStatus_MDX is dependent on the following input signals:

Input signal	Type	Meaning
Enable	BOOL	The input signal *Enable* is used to activate the function module. The task of the function module is only executed when this input signal *Enable* is set to *TRUE*.
Axis	AXIS_REF	The input signal *Axis* specifies the motor axis on which the actions of the function module are to be executed.

Output signals

The function module MC_ReadStatus_MDX has the following output signals:

Output signal	Type	Meaning
Done	BOOL	The output signal *Done* shows whether the PLCopenState has been transferred. • *TRUE*: The PLCopenState has been transferred. • *FALSE:* The PLCopenState has not been transferred.
Error	BOOL	The output signal *Error* shows whether an error occurred in the function module. • *TRUE*: An error occurred while the PLCopenState was being transferred. • *FALSE:* No error has occurred.
ErrorID	DWORD	The output signal *ErrorID* shows the error code of the error that occurred (→ Section "Error identifier").
Errorstop	BOOL	The output signal *Errorstop* shows whether the PLCopenState of the inverter is set to *Errorstop*. • *TRUE*: The PLCopenState is set to *Errorstop*. • *FALSE:* The PLCopenState is not set to *Errorstop*.
Stopping	BOOL	The output signal *Stopping* shows whether the PLCopenState of the inverter is set to *Stopping*. • *TRUE*: The PLCopenState is set to *Stopping*. • *FALSE:* The PLCopenState is not set to *Stopping*.
StandStill	BOOL	The output signal *StandStill* shows whether the PLCopenState of the inverter is set to *StandStill*. • *TRUE*: The PLCopenState is set to *StandStill*. • *FALSE:* The PLCopenState is not set to *Standstill*.
Discrete Motion	BOOL	The output signal *DiscreteMotion* shows whether the PLCopenState of the inverter is set to *DiscreteMotion*. • *TRUE*: The PLCopenState is set to *DiscreteMotion*. • *FALSE:* The PLCopenState is not set to *DiscreteMotion*.
Continuous Motion	BOOL	The output signal *ContinuousMotion* shows whether the PLCopen-State of the inverter is set to *ContinuousMotion*. • *TRUE*: The PLCopenState is set to *ContinuousMotion*. • *FALSE:* The PLCopenState is not set to *ContinuousMotion*.
Synchronized Motion	BOOL	The output signal *SynchronizedMotion* shows whether the PLCopen-State of the inverter is set to *SynchronizedMotion*. • *TRUE*: The PLCopenState is set to *SynchronizedMotion*. • *FALSE:* The PLCopenState is not set to *SynchronizedMotion*.
Homing	BOOL	The output signal *Homing* shows whether the PLCopenState of the inverter is set to *Homing*. • *TRUE*: The PLCopenState is set to *Homing*. • *FALSE:* The PLCopenState is not set to *Homing*.
Interpolation	BOOL	The output signal *Interpolation* shows whether the PLCopenState of the inverter is set to *Interpolation*. • *TRUE*: The PLCopenState is set to *Interpolation*. • *FALSE:* The PLCopenState is not set to *Interpolation*.

4.10 Error ID

The following table displays the error codes, error designations and a description of the errors that could occur at the *ErrorID* output of the function modules.

Error code	Error designation	Error description
General IEC error code		
FA0001h	E_IEC_GENERAL_MAX_NUMBER_OF_AXIS	The maximum number of axes that can be connected is exceeded.
FA0002h	E_IEC_GENERAL_INTERNAL_ERROR	Error during initialization of a MOVI-PLC® interface.
FA0003h	E_IEC_GENERAL_COM_NOT_READY	The COM interface is not ready.
FA0004h	E_IEC_GENERAL_INVALID_COM_NODE	The COM interface is not valid.
FA0005h	E_IEC_GENERAL_INVALID_COM_ADR	The COM address is not valid.
FA0006h	E_IEC_GENERAL_SIMULATION_NOT_AVAILABLE	The simulation mode for the module is not available.
FA0007h	E_IEC_GENERAL_INVERTER_NOT_REFERENCED	The module can only be executed when the axis has been referenced.
FA0008h	E_IEC_GENERAL_USE_OF_FB_NOT_ALLOWED	The use of the function module is not allowed in the current configuration.
FA0009h	E_IEC_GENERAL_AXIS_DISCONNECTED	The execution of the function module was interrupted because the connection to the inverter was interrupted. Execute the function module for MC_CONNECT_AXIS_MDX.Done = TRUE again.
FA0010h	E_IEC_GENERAL_WRONG_MOVI_PLC_FIRMWARE	The motion library cannot be used with the firmware version of the MOVI-PLC®.
FA0011h	E_IEC_GENERAL_SYNC_ALREADY_ESTABLISHED	The synchronization object was already set on the MOVI-PLC®.
FA0012h	E_IEC_GENERAL_INVALID_TECHNOLOGY_OPTION	The function module requires MOVI-PLC® application version T1 or higher.
FA0071h	E_IEC_PARAMETER_INVALID_SELECTION	Invalid input selection at function module.
FA0072h	E_IEC_PARAMETER_INVALID_SERVICE	Invalid service.
General IEC warning codes (appear at the output *ErrorID* without the output *Error* being set to *TRUE*)		
FA1000h	W_IEC_GENERAL_PARAMETER_RW_ERROR	Parameter telegram failed. The function module was correctly executed with incorrect parameters.
MPLCMotion_MDX/MX error codes		
FB0030h	E_MDX_CONNECTAXIS_NO_INVERTER_CONNECTED	No inverter detected at CAN bus. Check the CAN connection. Check the SBus address of MOVI-PLC® und MOVIDRIVE® B. Set *P889 Parameter channel 2* to "Yes".
FB0031h	E_MDX_CONNECTAXIS_CAN_ID_ERROR	The required CAN ID is occupied.
FB0032h	E_MDX_CONNECTAXIS_CYCLIC_COMMUNICATION	The cyclical communication between the MOVI-PLC® control and the inverter has been interrupted.
FB0033h	E_MDX_CONNECTAXIS_IPOS_DOWNLOAD_ERROR	Error during IPOS® download.
FB0034h	E_MDX_CONNECTAXIS_WRONG_DEVICE_CONNECTED	An incorrect unit is connected. Check the control configuration.
FB0036h	E_MDX_CONNECTAXIS_WRONG_MDX_FIRMWARE_VERSION	MOVIDRIVE® B with firmware version 16 or MOVIAXIS® with firmware version 20 is required when using the MPLCMotion_MDX/MX library.
FB0060h	E_MDX_POWER_INVERTER_NOT_READY	The inverter is assigned the status "24V operation" or "Safe stop". It cannot be switched on.
FB0061h	E_MDX_POWER_INVERTER_FAULT_STATE	The inverter is in error status. It cannot be switched on.
FB0070h	E_MDX_MOTIONBLOCK_INVALID_DATA_PROFIL	A motion function module cannot be executed from the current PLCopenState.

Error code	Error designation	Error description
FB0071h	E_MDX_MOTIONBLOCK_LOG_ADR_NOT_INITIALIZED	A motion function module was opened before MC_ConnectAxis_MDX/MX generated a logical address (AXIS_REF).
FB0072h	E_MDX_MOTIONBLOCK_INVALID_LOG_ADR	A motion function module was called up with an invalid logical address (AXIS_REF).
FB0073h	E_MDX_MOTIONBLOCK_INVALID_STATE	A motion function module cannot be executed from the current PLCopenState.
FB0074h	E_MDX_MOTIONBLOCK_INVALID_OPERATING_MODE	A motion function module cannot be executed in the operating mode of the inverter.
FB0075h	E_MDX_MOTIONBLOCK_INVALID_INVERTER_STATUS	A motion function module cannot be executed in the current status of the inverter.
FB0076h	E_MDX_MOTIONBLOCK_INVALID_VELOCITY	The speed specification is not within value range.
FB0077h	E_MDX_MOTIONBLOCK_INVALID_RAMP_TYPE	The function module cannot be executed with the currently set ramp type (*P916 Ramp type*).
FB0090h	E_MDX_PARAMCHANNEL_SEND_BUFFER_OVERFLOW	The buffer for the parameter channel is full.
FB0091h	E_MDX_PARAMCHANNEL_WRITEPARAMETER_BUSY	Parameter access occurs while the parameter channel is still busy
FB0092h	E_MDX_PARAMCHANNEL_READPARAMETER_BUSY	Parameter access occurs while the parameter channel is still busy
MPLCUtilities error codes		
FC0001h	E_CAN_IO_MODULE_TIME_OUT_SBUS_INIT	Internal timeout during SBus initialization.
FC0002h	E_CAN_IO_MODULE_TIME_OUT_WAGO_INIT	Timeout during initialization of the WAGO module.
FC0003h	E_CAN_IO_MODULE_NO_CONNECTION_DURING_INIT_SEQ	Termination of the connection to WAGO module during initialization.
FC0004h	E_CAN_IO_MODULE_WATCH_DOG_ERROR	Watchdog error. Communication to WAGO module interrupted.
FC0005h	E_CAN_IO_MODULE_ILLEGAL_CONFIGURATION	Incorrect configuration in the control configuration.
FC0006h	E_CAN_IO_MODULE_CAN_ID_ERROR	The CAN ID is already used.
FC0007h	E_CAN_IO_MODULE_INVALID_BYTES_NUMBER	The number of bytes is invalid. The number of bytes must be 4.
FC0008h	E_CAN_IO_MODULE_INVALID_PARAMETERS	Invalid values in index, subindex, bytes, WriteData.
FC0009h	E_CAN_IO_MODULE_TIME_OUT_SBUS	No response from the bus coupler.
MPLCSystem error codes (extract)		
F2000Ah	E_MVLINK_CAN	MOVILINK® error. Possible cause: Value outside the permitted range of values.
F20002h	E_MVLINK_RS485	MOVILINK® error. Possible cause: Value outside the permitted range of values.
F50069h	E_CONFDATAEX_NO_MATCH_FOR_PARAMSET	• No entry found in control configuration for this axis. • The SBus address set in the control configuration does not match the SBus address at the function module MC_ConnectAxis_MDX.

5 Programming Examples

This section describes how to program a number of drive tasks using the function modules described in this manual by means of specific examples.

Furthermore, this section introduces you to the basic functionality of the control configuration, the library manager and the [FUP Editor] of the MOVITOOLS® MotionStudio software.

For more information, refer to the online help of the MOVITOOLS® MotionStudio software.

5.1 Prerequisites

To be able to test the created programs with a motor axis, the following prerequisites must be fulfilled:

- The MOVI-PLC® control and a MOVIDRIVE® MDX60B/61B drive inverter with a connected motor are installed according to the instructions in the relevant manuals. Note that a motor with encoder is required for positioning.
- A system bus connection is installed correctly between the CAN 1 connection of the MOVI-PLC® control and the CAN 1 connection of the MOVIDRIVE® MDX60B/61B drive inverter in accordance with the instructions in the relevant manuals. When the MOVI-PLC® control communicates with the drive inverter via the backplane connector, you do not need the system bus connection via the CAN 1 connection.
- The engineering PC is connected correctly to the MOVI-PLC® control in accordance with the instructions in the relevant manuals. The interface of the engineering PC is configured correctly.
- You used the startup assistant to startup the MOVIDRIVE® MDX60/B61B drive inverter to be controlled with a MOVI-PLC® control (→ Section 3.3).

5.2 Positioning a motor axis

Task description

When a rising edge of DC 24 V occurs at a digital input of the connected MOVIDRIVE® MDX60B/61B drive inverter, the connected motor axis should turn 10 revolutions clockwise and be positioned.

The drive is operated by using only the digital inputs. The MOVI-PLC® control evaluates the inputs of the drive inverter and controls the positioning of the motor axis.

Sub-tasks

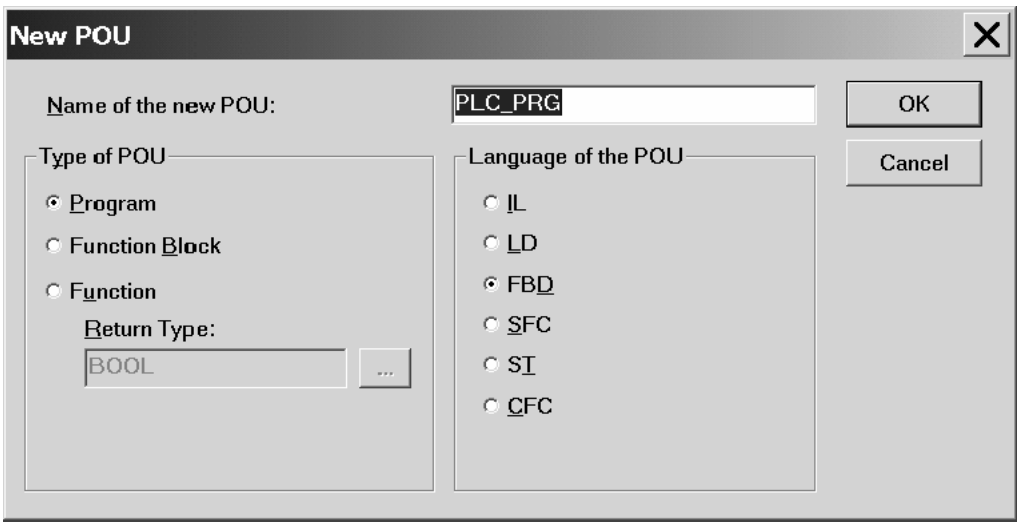
The programming example is divided into the following sub-tasks:

1. Creating a new project
2. Setting the control configuration
3. Installing the required libraries
4. Programming the communication with the motor axis
5. Programming the switch on/off procedure for the drive inverter
6. Programming the positioning process for the motor axis
7. Transferring the project to the MOVI-PLC® control
8. Testing the program

Step one

Creating a new project

1. Switch on the engineering PC and the MOVI-PLC® control[1)]
2. Start the PLC editor of the MOVITOOLS® MotionStudio software in accordance with the instructions in the section "Starting MOVITOOLS® MotionStudio" in the MOVI-PLC® manual.
3. Create a new project. To do this, select the menu item [File] / [NEW].
4. Select the configuration of your MOVI-PLC® in the dialog [Target system settings]. [MOVIPLC basic DHP11B] in this program example. Now press the <OK> button. The "New POU" window opens (→ following screenshot).



20030AXX

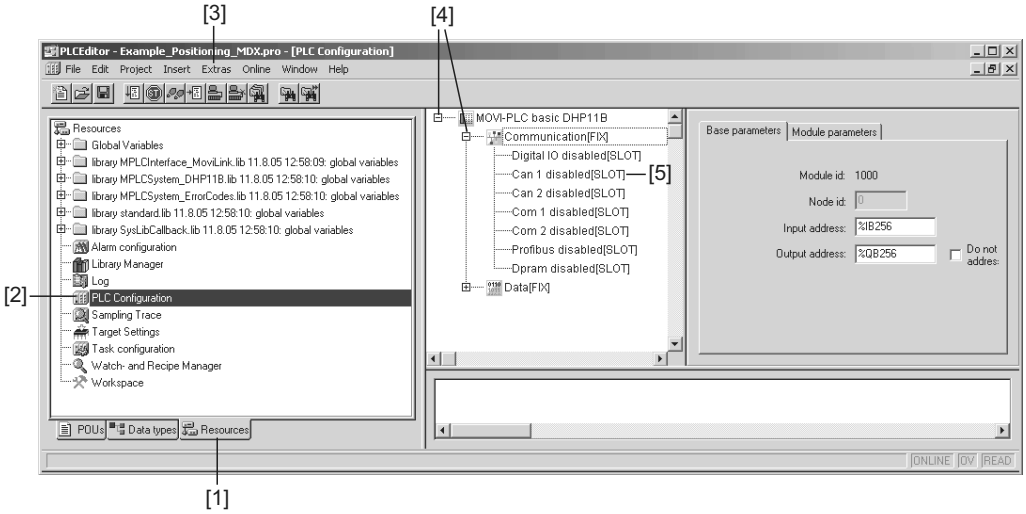
5. In this example, do not change the name of the function module "PLC_PRG" [2] in the [New POU] window. After you start the program (→ step 8 in this example), the MOVI-PLC® control will execute the module "PLC_PRG" automatically.
6. Select the [Program] option in the [Type of module] [1] group.
7. Select the [FBD] [3] option in the [Language of the POU] group. Click <OK> to confirm your entry.
8. Save the project. To do this, select [File] / [Save] menu item and enter the required name of the project. Save the project regularly once you have made a number of changes and after you have finished creating the program.

1) The MOVI-PLC® control must be powered as your version requires, or the drive inverter that the hardware of the MOVI-PLC® control is plugged into must be switched on.

Step two

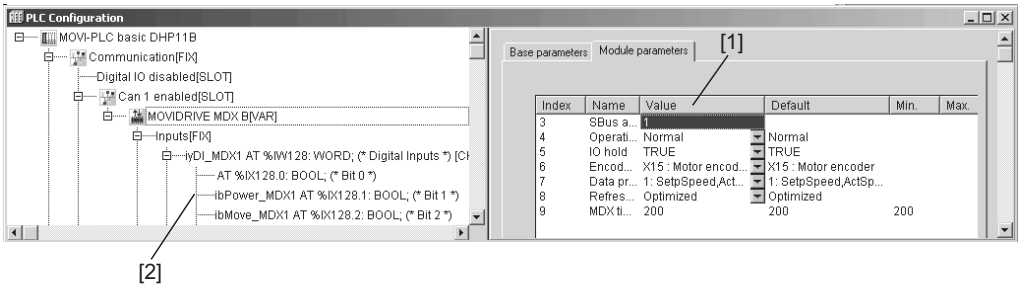
Setting the control configuration

Set the control configuration as required to be able to use the interfaces of the MOVI-PLC® control to connect peripheral equipment and to enable communication with other devices, e.g. inverters, I/O modules or a machine control.



58286AXX

1. Select the [Resources] tab from [1].
2. Activate by double-clicking the entry [PLC Configuration] [2].
3. Select the [Standard configuration] menu item in the [Extras] menu. The control configuration is now set [3]. A query appears asking whether you want to discard the current configuration and replace it with the standard configuration. Click <Yes> and confirm the query.
4. Open the configuration tree. Click on the [+] symbol in front of the entries [MOVI-PLC basic DHP11B] and [Communication] [4].
5. Activate the CAN 1 interface of the MOVI-PLC control. Now make a right mouse click on the element [Can 1 disabled] [5]. In the context menu, select the menu item [Replace element] / [Can 1 enabled].
6. Configure the MOVIDRIVE® MDX60B/61B inverter at the CAN 1 interface. Now right-click on the element [Can 1 enabled] and select the menu item [Append sub-element] and [MOVIDRIVE MDX B] in the context menu.



58223AXX

7. Select the element [MOVIDRIVE MDX B]. Select the [Module parameters] tab. Enter the SBus address selected during drive inverter startup under "Value" in the field [SBus address] [1].
8. In the control program, you can use the inputs / outputs by specifying the address details directly using the syntax "%I " / " %Q".

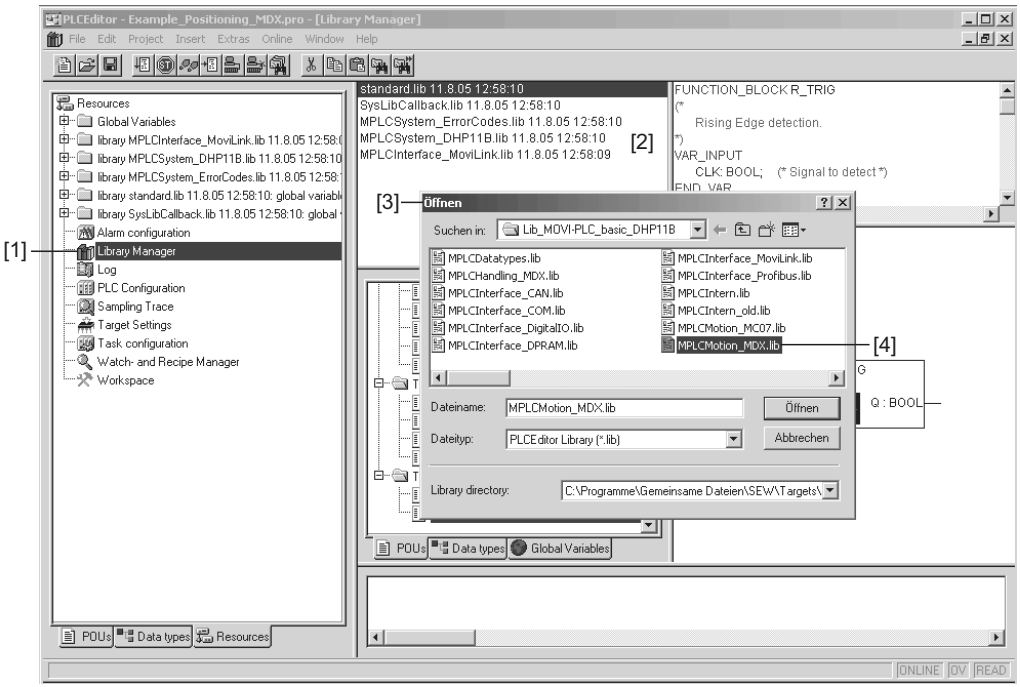
   However, it is easier to use symbolic identifiers. Proceed as follows:

   - Click on the [+] symbol in front of the entries "MOVIDRIVE MDX B "and "Inputs".
   - Click on the corresponding field [AT] in the configuration tree. Enter the required name. In this example, the symbolic identifier for the digital inputs of the inverter is *DI_MDX1*. For individual inputs / outputs, the symbolic identifiers are *ibPower_MDX1* and *ibMove_MDX1* [2].

Step three

Installing the libraries

To use the function modules of the `MPLCMotion_MDX.lib` library, add the [MPLCMotion_MDX.lib] library to the existing libraries as follows.



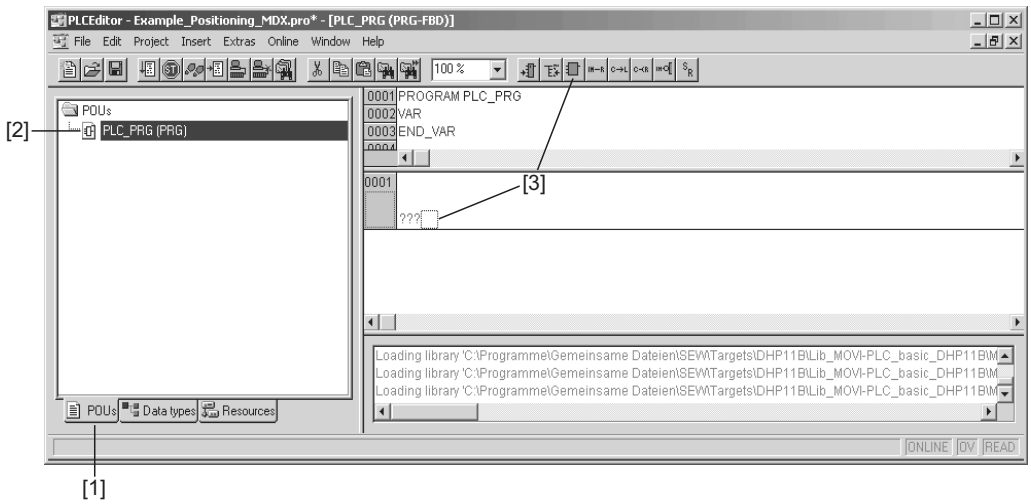
58290AXX

1. Activate by double-clicking the entry [Library Manager] [1].
2. Use the right mouse button to click in the library field [2]. Select the [Additional library] menu item. A window opens for selecting the library [3].
3. Select the `MPLCMotion_MDX.lib` library [4] and click the <Open> button. The selected library appears in the PLC editor in the library field [2].

Step four

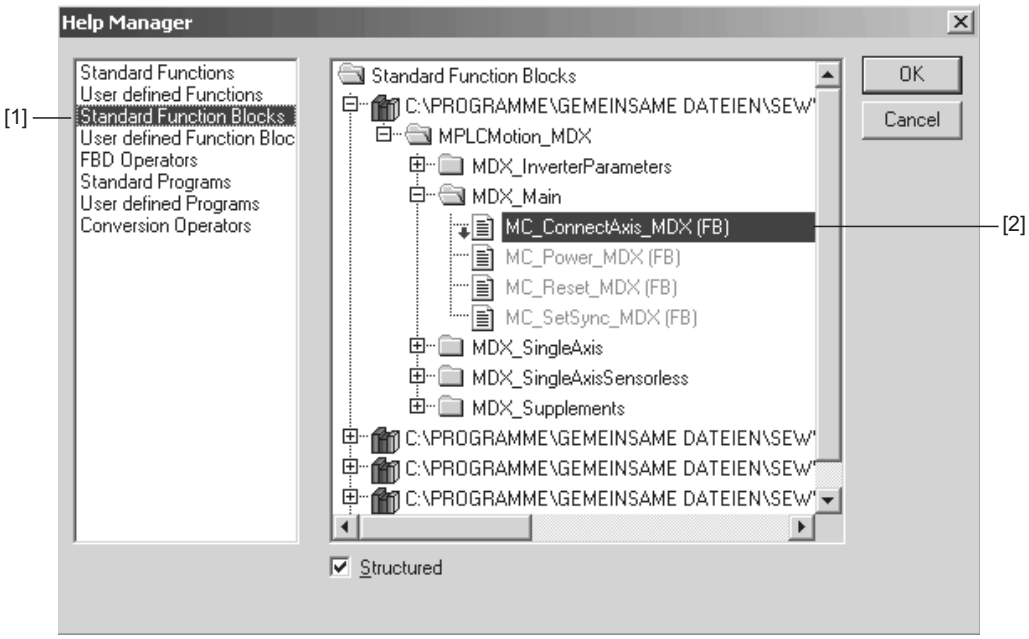
Programming the communication with the motor axis

To establish and execute communication between the MOVI-PLC® control and the drive inverter, add an instance of the MC_ConnectAxis_MDX function module as follows:



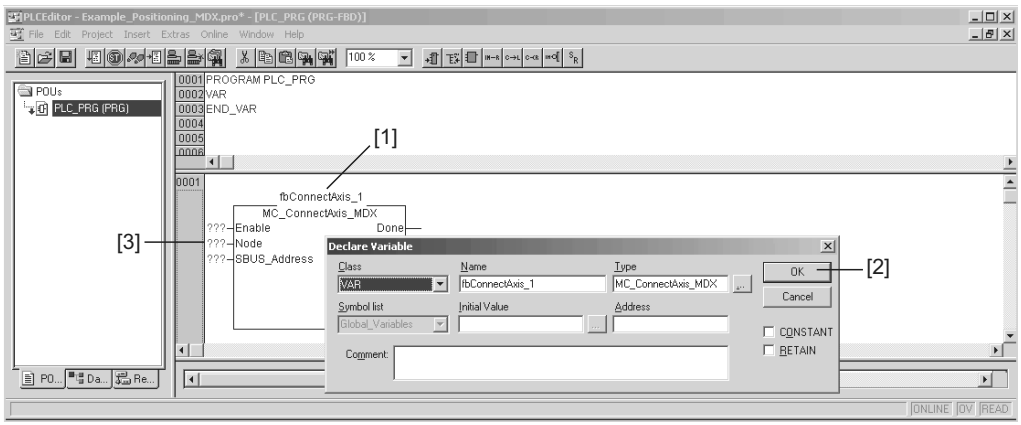
58292AXX

1. Select the [POUs] tab from [1].
2. Open the editor of the *PLC_PRG(PRG)* module by double-clicking on the entry [2].
3. Add a new function module. First click on the box next to the questions marks [???] in the first network and then click on the symbol [ ] [3].
4. Select the text "AND" in the function module you have just added.
5. Press the <F2> button. The [Help Manager] opens (→ following screenshot).



58222AXX

6. In the Help Manager on the left of the screen, select the entry [Standard function blocks] [1].
7. In the Help Manager on the right of the screen, select the function module *MC_ConnectAxis_MDX (FB)* [2] from the `MDX_Main` directory of the `MPLCMotion_MDX` library. Confirm your selection by clicking [OK]. The new function module is shown in the PLC editor.



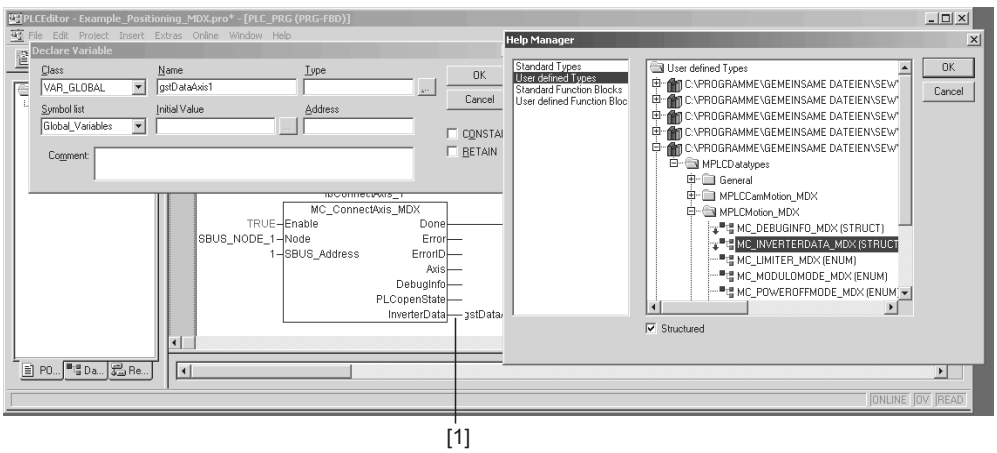
58221AXX

8. Click on the inserted function module *MC_ConnectAxis_MDX* in the PLC editor and then on the question marks "???" above the function module [1].
9. Enter the instance name (e.g. *fbConnectAxis_1*) of the function module and press the <ENTER> key. Confirm the [Variable declaration] dialog that appears with <OK> [2].
10. Enter the values listed in the following table at the input signals of the function module. To do this, click the on the question marks "???" [3] to the left of the input signal, enter the values and then press the <ENTER> key.

Enable	*TRUE*
Node	*SBUS_NODE_1*
SBUS_Address	The SBUS 1 address set for inverter startup

11. For example, enter the following variable at the *InverterData* output [1] of the function module:

InverterData	*gstDataAxis1* of type MC_INVERTERDATA_MDX

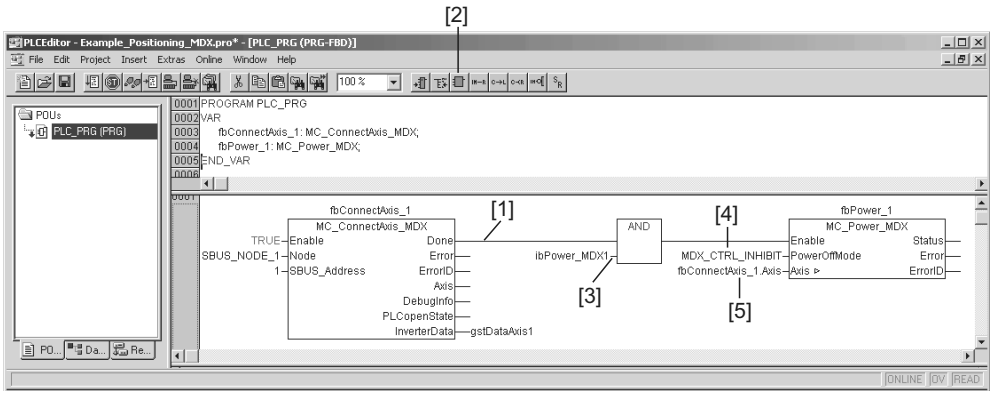


58220AXX

Step five

Programming the switch on / off procedure for the inverter

Insert a function module that switches the MOVIDRIVE MDX60B/61B inverter on/off. The drive inverter can only be switched on if the MC_ConnectAxis_MDX function module for this axis has already been executed. SEW-EURODRIVE recommends only switching on the inverter when the DC 24 V voltage is applied at the binary input *DI01*. Therefore, the corresponding signals are linked with each other using an "AND" module.



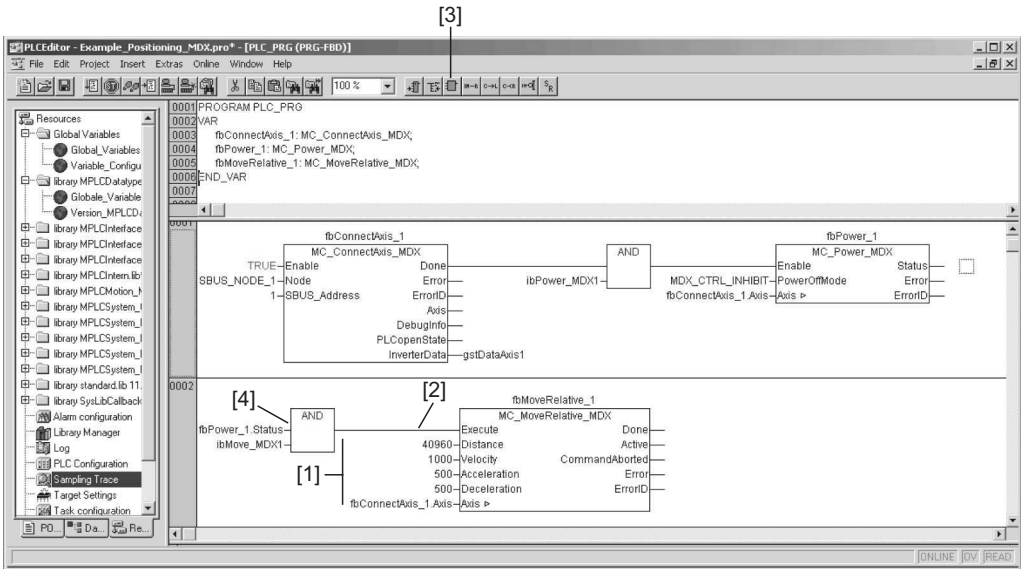
58294AXX

1. Click on the line of the *Done* [1] output of the MC_ConnectAxis_MDX function module.
2. Add a new "AND" function module. To do so, click on the symbol <> [2].
3. At the second input of the new "AND" function module [3], add the value read at binary digital input *DI01* of the inverter. To do so, enter the symbolic name selected in the control configuration (in this example, *iyDI_MDX1_DI.1* or directly *ibPower_MDX1*).
4. Add the function module MC_Power_MDX. To do so, click to the right of the "AND" function module and then on the symbol [] [2]. Convert the "AND" function module that you have added to a MC_Power_MDX function module by following the instructions described in step 4. Enter an instance name for the function module, e.g. *ibPower_1*.
5. Enter the constants *MDX_CTRL_INHIBIT* at the input signal *PowerOffMode* of the function module MC_Power_MDX [4].
6. At the input signal *Axis*, enter the axis reference *fbConnectAxis_1.Axis* [5] that is output from the module instance *fbConnectAxis_1.* To do so, click the field "???" before the input signal *Axis* and enter *fbConnectAxis_1.* Select the entry "Axis" from the dialog box that appears automatically after entering the item. Confirm your entry by pressing the <ENTER> button.

Step six

Programming the positioning process for the motor axis

Insert an MC_MoveRelative_MDX function module that controls a relative positioning movement of the motor axis. In this example, the motor axis should turn ten revolutions (≙ 10 x 4096 increments of the encoder) clockwise each time a rising edge of the DC 24 V voltage occurs at the binary input *DI02*. During constant travel, the motor axis should turn at a speed of 1000 rpm.



11287AXX

1. Click the right mouse button in a free area of the network [0001]. In the context menu, select the [Network (after)] menu item.
2. Add a function module MC_MoveRelative_MDX in the new network [0002] as described in step four and specify an instance name (e.g. *fbMoveRelative_1*). The MC_MoveRelative_MDX function module is included in the [MDX_SingleAxis] directory of the [MPLCMotion_MDX] library under the [Standard Function Blocks] entry.
3. Enter the following values at the input signals of the function module MC_MoveRelative_MDX [1]:

Distance	*40960*
Velocity	*1000*
Acceleration	*500*
Deceleration	*500*
Axis	*fbConnectAxis_1.Axis*

4. The travel command is only executed when the MC_Power_MDX function module has been executed beforehand. Therefore, at the input signal *Execute* of the MC_MoveRelative_MDX function module, enter the result of an "AND" connection between the output signal *Status* of the MC_Power_MDX function module and the binary input, which is provided to start the movement.

   To do so, click on the line before the input signal *Execute* [2]. Add a new "AND" function module. To do so, click on the symbol [ ] [3]. Assign the input signals of the "AND" function module as required [4].
5. To rebuild the project, select the menu item [Project] / [Rebuild all]. When the programming is error-free, the message window displays the message "0 Error(s), 0 Warnings(s)".

Step seven

Transferring project to the MOVI-PLC® control

Select the menu item [Online] / [Communication Parameters]).

In the dialog box that opens, set the communication parameters in accordance with the communication channel to be used. You only have to perform this step once.

Now select the menu item [Online] / [Login].

In the dialog box that appears, confirm that you want to load a program by clicking [Yes].

Step eight

Testing the program

In the final step, execute the program by activating the digital inputs as required.

Warning:

Depending on the terminal assignment, the inverter status and the control program, the motor axis can begin to move immediately after the MOVI-PLC® control has been started. To prevent risk of injury, keep sufficient distance from all moving parts.

Turn on the MOVIDRIVE® MDX60B/61B inverter if it was not already switched on in step one in connection with the MOVI-PLC® control.

Start the MOVI-PLC® control. To do this, select the menu item [Online] / [Start].

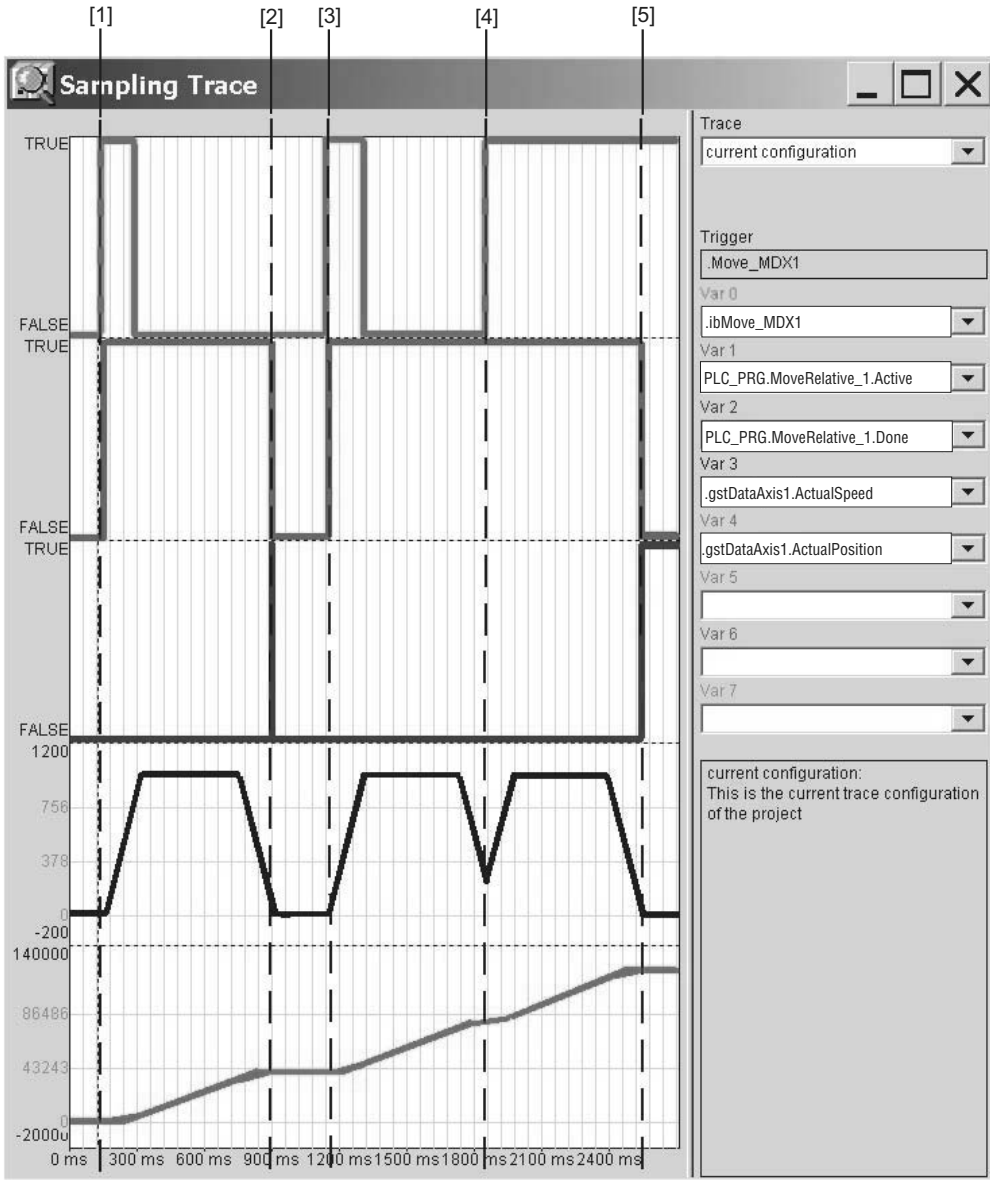
Turn on the inverter. Apply the DC 24 V voltage first to binary input *DI00* "Controller inhibit" and then to binary input *DI01* (Enable of the MC_Power_MDX function module).

Start positioning movement of the motor axis. To do so, apply the DC 24 V voltage at the binary input *DI02* of the inverter.

Programming was correct when the motor axis turns ten revolutions clockwise each time a rising edge of DC 24-V occurs at the binary input *DI02*.

For more details on the behavior of the MOVI-PLC® control and the connected MOVIDRIVE® inverter in this example, refer to the following section "Trace recording".

Trace recording



58296AXX

When a rising edge occurs at the *Move_MDX1* signal at the input *Execute* of the MC_MoveRelative_MDX function module, the motor axis starts to move to the target position [1]. The *Active* output shows that this is the case when it is set to *TRUE*.

Once positioning is complete, the function module resets the *Active* output signal to *FALSE* and sets the output signal *Done* to *TRUE* [2]. In this example, the output signal *Done* is only set to *TRUE* for one control cycle because the *Execute* input signal was already reset to *FALSE* before the positioning was concluded.

As a rising edge then occurs at the input signal *Execute*, the motor axis starts the positioning process again [3].

However, the next rising edge occurs at the *Execute* input before positioning has been concluded. Another positioning process, starting from the current position of the motor axis at the time the last rising edge occurred at the *Execute* input, is started without interruption [4]. In this way, the motor axis is not slowed to a standstill, but starts the next movement directly.

Once positioning is complete, the function module resets the output signal *Active* to

FALSE. In this case, however, the *Done* output signal remains set to TRUE after positioning is complete because the Execute input signal has not been reset to FALSE [5].

5.3 Speed control of a motor axis with encoder

Task description

When a rising edge of DC 24 V voltage occurs at a binary input of the MOVIDRIVE® MDX60B/61B drive inverter, the connected motor axis should start movement subject to speed control. The speed of the motor axis should be able to be switched between two values using another binary input. Two inputs should be used to start a braking process with the help of the function module MC_Stop_MDX or MC_AxisStop_MDX.

The drive is operated by using only the binary inputs. The MOVI-PLC® control evaluates the binary inputs of the drive inverter and controls the speed of the motor axis.

Programming

Unchanged steps

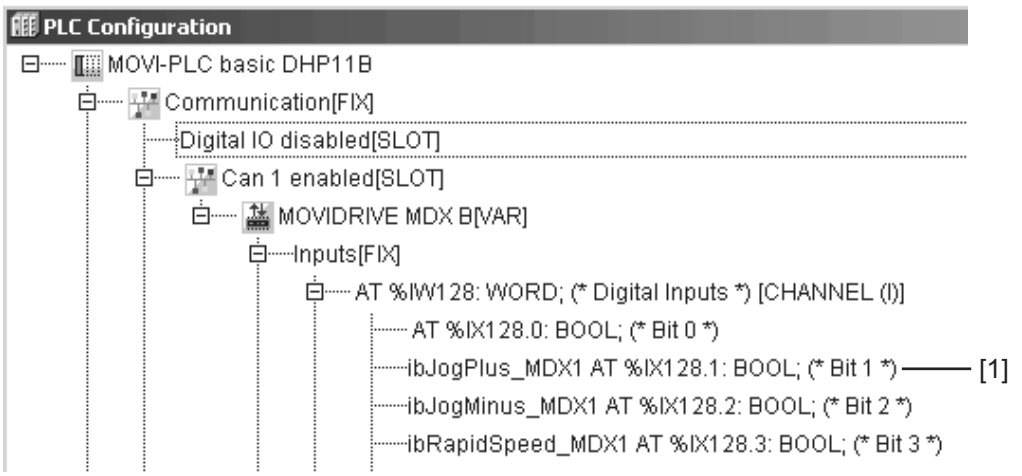
Program steps one, three, four, five and seven as described in the previous programming example "Positioning a motor axis".

Step two

Setting the control configuration

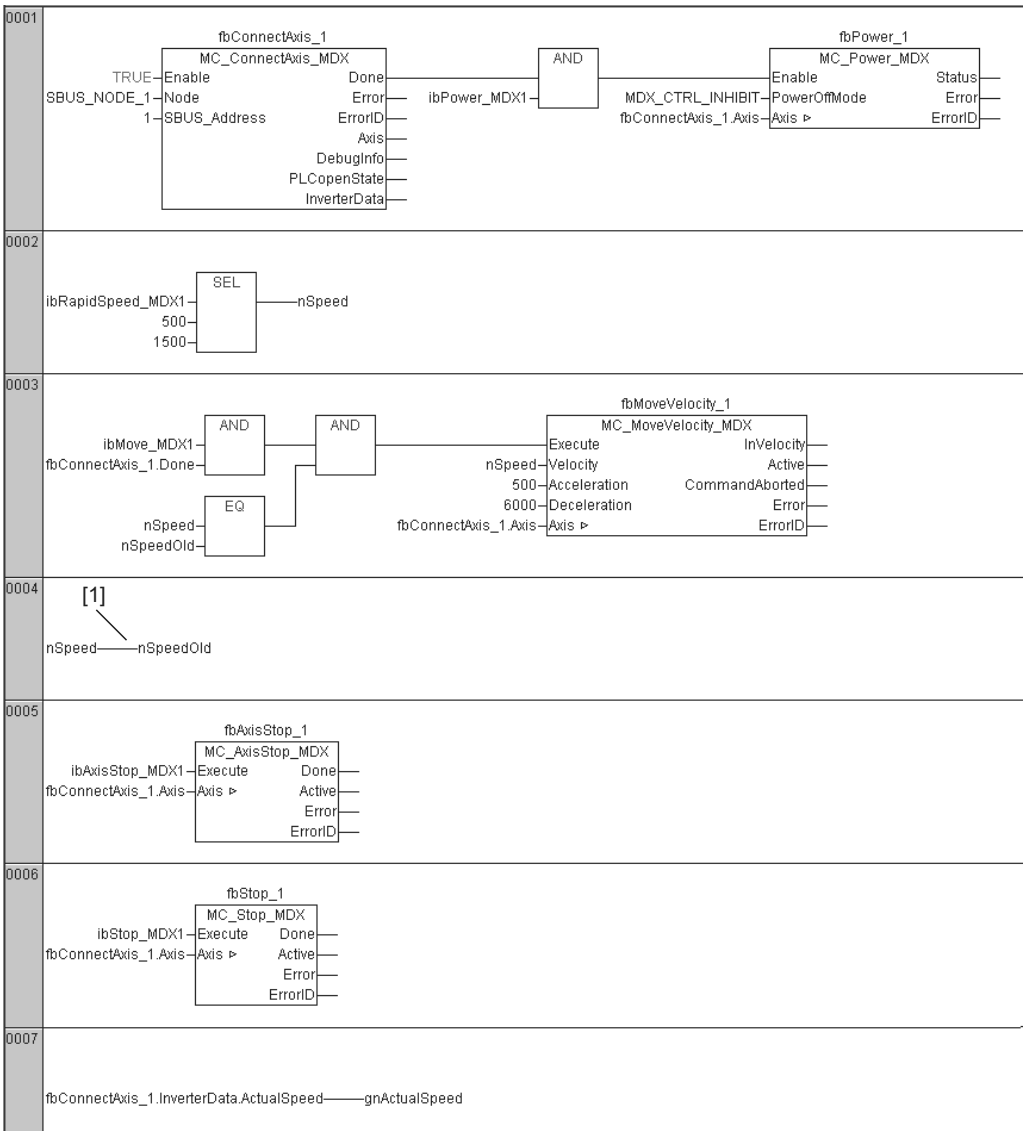
In the control configuration, assign the identifiers *Power_MDX1* and *Move_MDX1* as well as the following identifiers to the binary inputs of the drive inverter MOVIDRIVE® MDX60B/61B according to the figure [1].

- *ibRapidSpeed_MDX1*
- *ibAxisStop_MDX1*
- *ibStop_MDX1*


PLC Configuration
MOVI-PLC basic DHP11B
Communication[FIX]
Digital IO disabled[SLOT]
Can 1 enabled[SLOT]
MOVIDRIVE MDX B[VAR]
Inputs[FIX]
AT %IW128: WORD; (* Digital Inputs *) [CHANNEL (I)]
AT %IX128.0: BOOL; (* Bit 0 *)
ibJogPlus_MDX1 AT %IX128.1: BOOL; (* Bit 1 *)
[1]
ibJogMinus_MDX1 AT %IX128.2: BOOL; (* Bit 2 *)
ibRapidSpeed_MDX1 AT %IX128.3: BOOL; (* Bit 3 *)

58218AXX

Step six **Programming the speed control function**



58219AXX

1. Create the program shown in the diagram in accordance with the procedure described in the previous programming example.
2. To program the value assignment of the variable *nSpeed* to the variable *nSpeed_old*, insert the network [0004] and then click on the box next to the question marks "???". Then press the symbol [IN–R] [1].

   Replace the question marks "???" with the variable names.

Step eight

Testing the program

Execute the program by activating the digital inputs as required.

Warning:

Depending on the terminal assignment, the drive inverter status and the control program, the motor axis can begin to move immediately after the MOVI-PLC® control has been started. To prevent risk of injury, keep sufficient distance from all moving parts.

Turn on the MOVIDRIVE® MDX60B/61B drive inverter if it was not already switched on in step 1 in connection with the MOVI-PLC® control.

Start the MOVI-PLC® control. To do this, select the menu item [Online] / [Start].

Turn on the drive inverter once again. Apply the DC 24 V voltage first to binary input *DI00* "Controller inhibit" and then to binary input *DI01* (*Enable* of MC_Power_MDX function module).

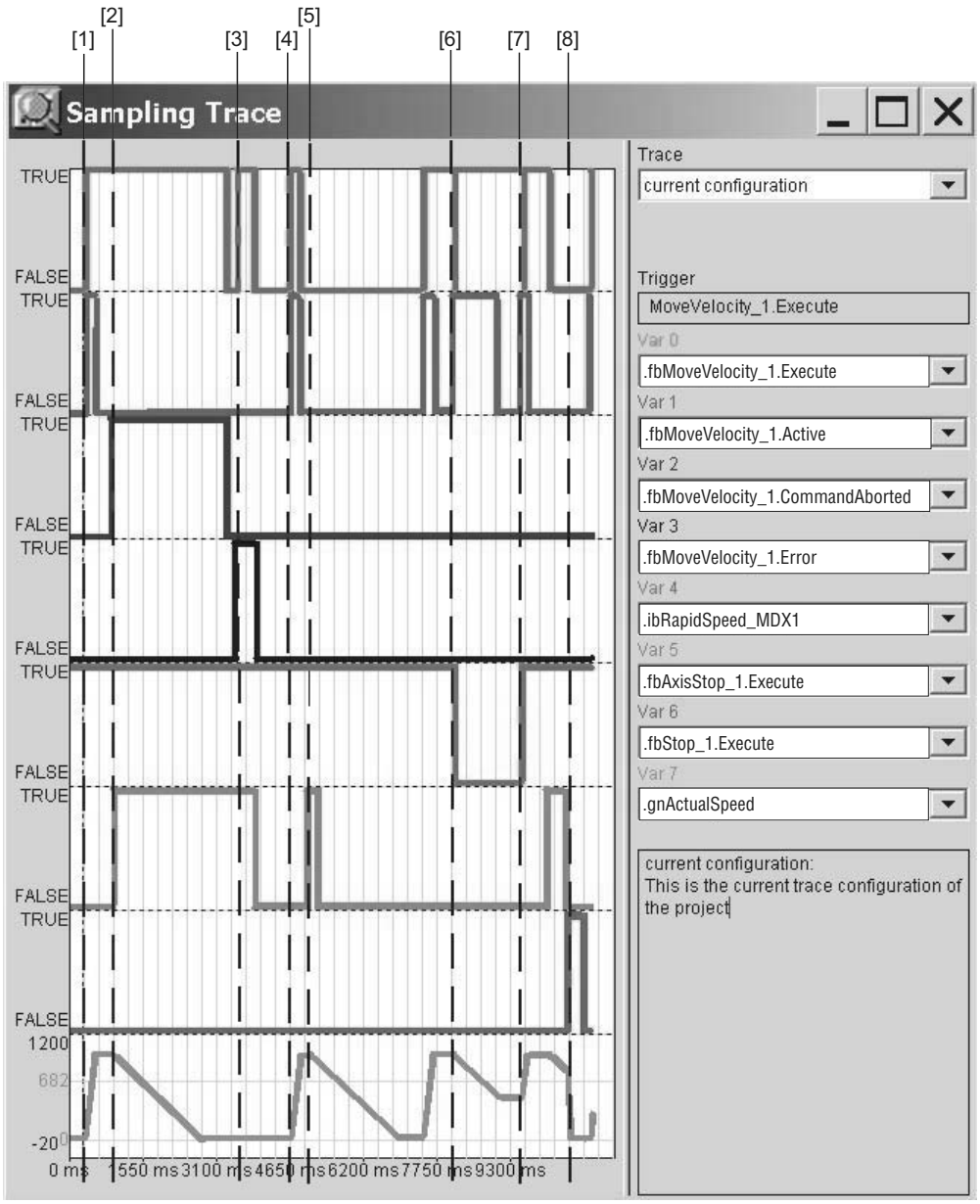
Start the speed control of the motor axis. To do so, apply the DC 24-V voltage at the binary input *DI02* of the drive inverter.

Programming is correct when

- The motor axis begins to turn when a rising edge of DC 24 V voltage occurs at binary input DI02
- The speed of the motor axis switches between 500 rpm and 1000 rpm when the voltage is switched between 0 V and DC 24 V at the binary input *DI03*
- The speed of the motor axis is slowed when the DC 24 V voltage is applied at the binary input *DI04* or *DI05.*

For more details on the behavior of the MOVI-PLC® control and the connected MOVIDRIVE® drive inverter in this example, refer to the following section "Trace recording".

Trace recording



58305AXX

The motor axis starts speed control when a rising edge occurs at the input signal *Execute* of the MC_MoveVelocity_MDX function module [1]. The function module sets the output signal *Active* to *TRUE* until the setpoint speed is reached. When the setpoint speed is reached, the output signal *Active* is reset to *FALSE* and the output signal *InVelocity* (not shown in the time diagram) is set to *TRUE*.

Due to a rising edge at the input signal *Execute* of the MC_AxisStop_MDX function module, the motor axis executes a braking process with the deceleration speed defined at the input signal *Deceleration* of the MC_MoveVelocity_MDX function module [2]. The MC_MoveVelocity_MDX function module shows the cancellation of the speed control task by setting the *CommandAborted* output signal to *TRUE*.

While the input signal *Execute* of the MC_AxisStop_MDX function module is still set to *TRUE*, another rising edge occurs at the MC_MoveVelocity_MDX function module. Although the braking process was already complete, the motor axis does not move. To restart movement, the status *Stopping* must first be revoked by resetting the input signal *Execute* of the MC_AxisStop_MDX function module to *FALSE*. As soon as the condition is fulfilled, the motor axis starts movement with speed control again when a rising edge occurs at the input signal *Execute* of the MC_MoveVelocity_MDX function module [4].

A braking process is restarted when a rising edge occurs at the input signal *Execute* of the MC_AxisStop_MDX function module [5]. However, in this case the MC_MoveVelocity_MDX function module does not set the *CommandAborted* output signal to *TRUE* because the *Execute* input signal has already been reset to *FALSE*.

When the *ibRapidSpeed_MDX1* signal is changed from *TRUE* to *FALSE*, the input signal *Execute* of the MC_MoveVelocity_MDX function module is reset to *FALSE* [6]. The reset is caused by the comparison module [EQ] in the control program during a control cycle. The rising edge in the following control cycle activates the speed control with the new, slower setpoint speed. Accordingly, the motor axis turns at the higher speed again when the *ibRapidSpeed_MDX1* signal is changed to TRUE [7].

The braking process started by a rising edge at the input signal *Execute* of the MC_AxisStop_MDX function module can be cancelled by a rising edge at the input signal *Execute* of the MC_Stop_MDX function module. Consequently, the braking process is executed using the brake ramp set in the parameters of the drive inverter [8].

5.4 Jog mode of a motor axis without encoder

Task description

In this programming example, jog mode is to be performed with two motor axis speeds.

To do this, two binary inputs of the controlled MOVIDRIVE® MDX60B/61B drive inverter are used for the signals *Jog positive* and *Jog negative*. The motor axis should turn in jog mode when the DC 24 V voltage is applied at one of the two binary inputs. Otherwise, the drive must be slowed down. The speed of the motor axis should be able to be switched between two values using another binary input.

The drive is operated by using only the digital inputs. The MOVI-PLC® control evaluates the inputs of the drive inverter and controls the speed of the motor axis.

Programming

Unchanged steps

Program steps one, three, four and seven as described in the previous programming examples "Positioning a motor axis" and "Speed control of a motor axis with encoder".

Note:

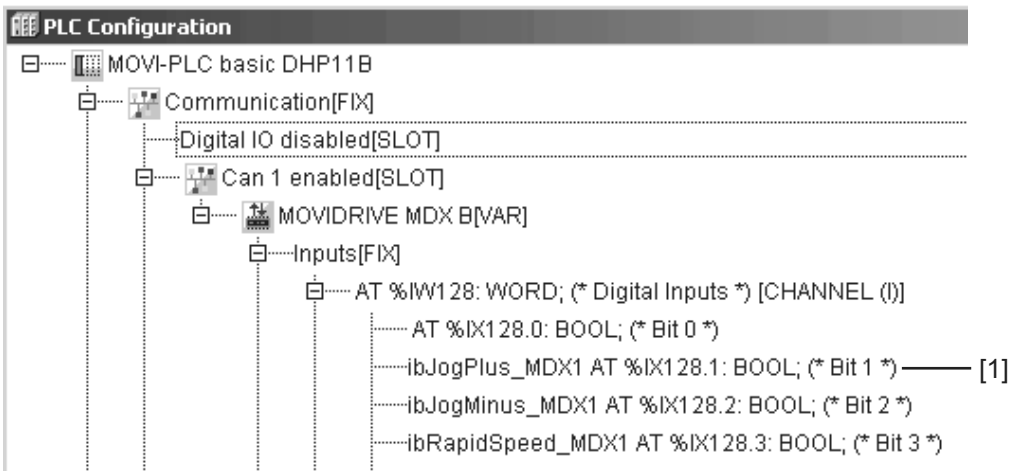
You do not have to program step five because the MC_Power_MDX function module must not used for motor axes without encoders.

Step two

Setting the control configuration

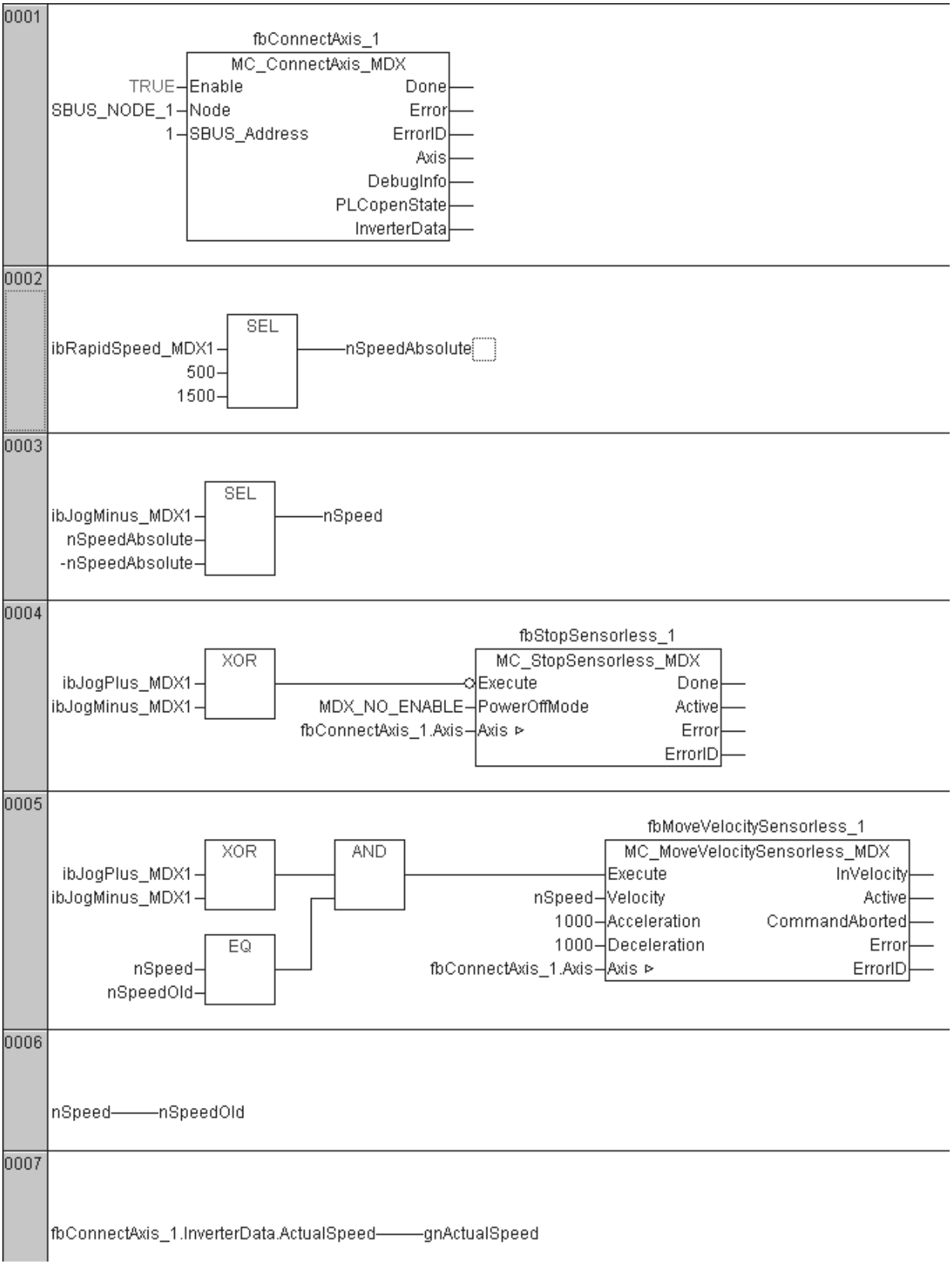
In the control configuration, assign the following identifiers to the digital inputs of the drive inverter MOVIDRIVE MDX60B/61B according to the following figure [1].

- *ibJogPlus_MDX1*
- *ibJogMinus_MDX1*
- *ibRapidSpeed_MDX1*


PLC Configuration
MOVI-PLC basic DHP11B
Communication[FIX]
Digital IO disabled[SLOT]
Can 1 enabled[SLOT]
MOVIDRIVE MDX B[VAR]
Inputs[FIX]
AT %IW128: WORD; (* Digital Inputs *) [CHANNEL (I)]
AT %IX128.0: BOOL; (* Bit 0 *)
ibJogPlus_MDX1 AT %IX128.1: BOOL; (* Bit 1 *)
[1]
ibJogMinus_MDX1 AT %IX128.2: BOOL; (* Bit 2 *)
ibRapidSpeed_MDX1 AT %IX128.3: BOOL; (* Bit 3 *)

58218AXX

Step six **Programming jog mode**



58217AXX

Create the program shown in the diagram in accordance with the procedure described in the previous programming examples.

Step eight **Testing the program**

Execute the program by activating the digital inputs as required.

Warning:

Depending on the terminal assignment, the drive inverter status and the control program, the motor axis can begin to move immediately after the MOVI-PLC® control has been started. To prevent risk of injury, keep sufficient distance from all moving parts.

Turn on the MOVIDRIVE® MDX60B/61B drive inverter if it was not already switched on in step one in connection with the MOVI-PLC® control.

Start the MOVI-PLC® control. Now select the menu item [Online] / [Start] (or [Run]).

Deactivate the controller inhibit. To do so, apply the DC 24-V voltage at the binary input *DI00* "/ Controller inhibit".

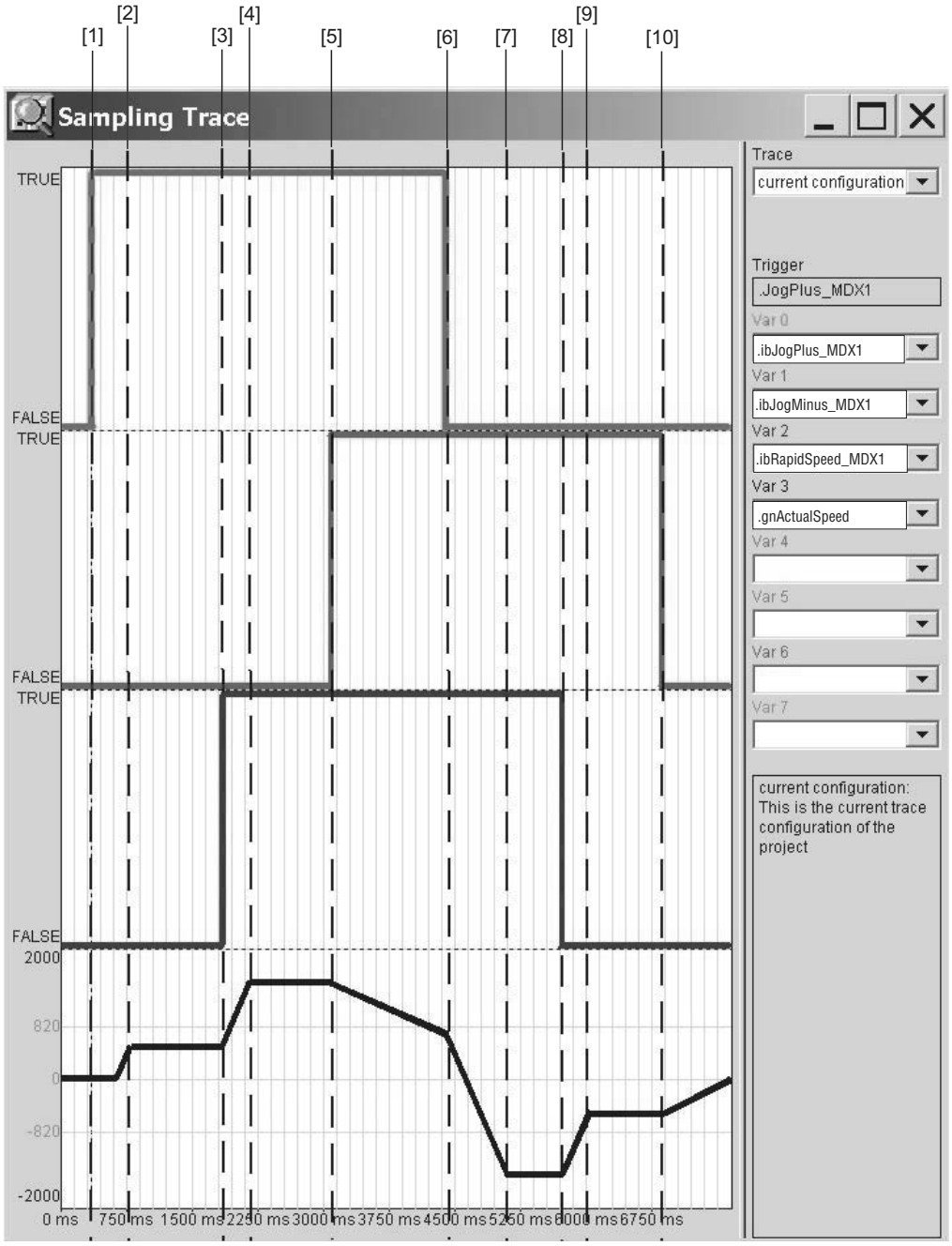
Start the jog mode of the motor axis. To do so, apply the DC 24 V voltage to one of the one of the two binary inputs *DI01* or *DI02* of the drive inverter.

Programming is correct when

- The motor axis turns in a positive (clockwise) or negative (counterclockwise) direction when DC 24 V is applied at binary input *DI01* or *DI02*
- The absolute value of the motor speed switches between 500 rpm and 1000 rpm when the voltage is switched between 0V and DC 24 V at the binary input *DI03*
- The motor axis is decelerated by applying the DC 24 V voltage to both the binary inputs *DI01* and *DI02* or by removing the voltage from both

For more details on the behavior of the MOVI-PLC® control and the connected MOVIDRIVE® drive inverter in this example, refer to the following section "Trace recording".

Trace recording



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When a rising edge occurs at the *ibJogPlus_MDX1* signal, the motor axis starts speed control using the speed specified by the *ibRapidSpeed_MDX1* signal [1].

When the *ibRapidSpeed_MDX1* signal changes from *FALSE* to *TRUE*, the motor axis increases the speed to the higher of the two values [3].

If both signals *ibJogPlus_MDX1* and *ibJogMinus_MDX1* are set to *TRUE* at the same time, the XOR operation, in conjunction with the negation in the control program, causes a rising edge at the *Execute* input signal of the MC_StopSensorless_MDX function module. The braking process is started [5].

For axes without encoders, a braking process triggered by a rising edge at the Execute input signal of the MC_StopSensorless_MDX function module can be cancelled. The cancellation is executed when a speed-controlled movement is called up by a rising edge at the Execute input signal of the MC_MoveVelocitySensorless_MDX function module [6].

In this example, the required rising edge is generated by the XOR operation in the [0005] network when the *ibJogPlus_MDX1* signal is switched from *TRUE* to *FALSE*.

When the *ibRapidSpeed_MDX1*signal switches from *TRUE* to *FALSE*, the motor axis is slowed down to the lower of the two speeds [8].

Resetting both the signals *ibJogPlus_MDX1* and *ibJogMinus_MDX1* to *FALSE* starts the braking process in the same way as setting both signals to *TRUE* as described above [10].

6 Appendix

6.1 Overview of the transferred MOVIDRIVE® / MOVIAXIS® actual values

Various cyclic and acyclic process data objects are transferred between the MOVI-PLC® control and the MOVIDRIVE® MDX60B/61B inverter / MOVIAXIS® servo inverter via the CAN bus. Each connected inverter or servo inverter sends its actual values to the MOVI-PLC® control. The type of transferred actual values and the cycle time with which the actual values are transferred is dependent on the data profile that is set in the control configuration for the module parameters of the inverter or servo inverter ("Data profile" entry). The following table gives an overview of the MOVIDRIVE® / MOVIAXIS® actual values transferred and the cycle time required to send the actual values to the MOVI-PLC® control.

MDX / MX actual values	"Data profile"	MOVIDRIVE® B				MOVIAXIS®
		1	2	3	4[1]	1 ... 4
	"Optimized Refresh Time"[2]					
Status word	During change	X	X	X	X	X
MDX /MX inputs	During change	X	X	X	X	X
Touch probe positions	During change	X	X	X	X	-
Setpoint speed	2 ms	X	-	-	-	-
	3 ms	-	X	-	X	-
Actual speed	During change	-	-	-	-	X
	2 ms	X	-	X	-	-
	3 ms	-	X	-	X	-
Actual position (according to encoder type in the control configuration)	During change	-	-	-	-	X
	2 ms	X	-	X	-	-
	3 ms	-	X	-	X	-
Modulo actual position	During change	-	-	-	-	X
	3 ms	-	X	-	-	-
Active current	During change	-	-	-	-	X
	2 ms	-	-	X	-	-
	3 ms	-	X	-	-	-
Analog inputs	10 ms	-	X[3]	-	-	-

1) You can freely configure additional MDX actual values for the "Data profile" 4 setting using the function module MC_GetDataProfile4Data_MDX.

2) In addition to the "Optimized Refresh Time" you can also set transmission rates of 5 ms, 10 ms, 20 ms, 30 ms, 40 ms, 50 ms and 100 ms. The Refresh Time set applies to all MDX / MX actual values (see footnote 3 for exceptions).

3) Even if you set the "Refresh time" to 5 ms, the analog inputs will still be transferred in a 10 ms cycle.

6.2 CAN identifier

The system bus is a CAN bus in accordance with CAN specification 2.0. The identifier is a component of each CAN telegram. The identifier is a series of 11 bits that decides in the case of concurrent bus access, which telegram is sent and which is reset. The identifier with the lower value has the higher priority. Therefore it must be ensured that two different participants do not attempt to simultaneously send telegrams with the same identifier.

All data that is to be exchanged via a CAN bus between participants must be packed in such telegrams. Data exchange between a MOVI-PLC® and the inverters is automatically configured. In this way, identifiers are reserved depending on the addresses for these telegrams. You also have the option to configure additional telegrams between participants for which you must assign a unique identifier. Therefore you must ensure that several participants do not send telegrams with the same identifier. The following tables give you an overview of the identifiers that are used in the MOVILINK® protocol by the MPLCMotion_MDX library and in accordance with CANopen.

Identifier in MOVILINK® protocol

Identifier	Message type
8 x SBus address	Unassigned
(8 x SBus address) + 1	Unassigned
(8 x SBus address) + 2	Unassigned
(8 x SBus address) + 3	Process output data telegram (PA data)
(8 x SBus address) + 4	Process input data telegram (PE data)
(8 x SBus address) + 5	Synchronous process output data telegram (PA data synchronous)
(8 x SBus address) + 512 + 3	Parameter request telegram channel 1 (Preq1)
(8 x SBus address) + 512 + 4	Parameter response telegram channel 1 (Pres1)
(8 x SBus address) + 512 + 5	Parameter request telegram channel 2 (Preq2)
(8 x SBus address) + 512 + 7	Parameter response telegram channel 2 (Pres2)
(8 x SBus group address) + 6	Group process output data telegram (group PA data)
(8 x SBus group address) + 7	Unassigned
(8 x SBus group address) + 512 + 6	Group parameter request telegram (GPreg) (only for SBus group addresses 0 ... 63)

Identifier of the MPLCMotion_MDX/MX libraries

Identifier	Message type
128	Synchronization telegram
129	Virtual encoder
1024 + (11 x SBus address)	PDO1 (MOVI-PLC® MDX/MX)
1024 + (11 x SBus address) + 1	PDO2 (MDX/MX MOVI-PLC®)
1024 + (11 x SBus address) + 2	PDO3 (MDX/MX MOVI-PLC®)
1024 + (11 x SBus address) + 3	PDO4 (MDX/MX MOVI-PLC®)
1024 + (11 x SBus address) + 4	PDO5 (MDX/MX MOVI-PLC®)
1024 + (11 x SBus address) + 5	PDO6 (MDX/MX MOVI-PLC®)
1024 + (11 x SBus address) + 6	PDO10 (MDX/MX MOVI-PLC®)
1024 + (11 x SBus address) + 7	PDO11 (MOVI-PLC® MDX/MX)
1024 + (11 x SBus address) + 8	PDO12 (MOVI-PLC® MDX/MX)
1024 + (11 x SBus address) + 9	Reserved
1024 + (11 x SBus address) + 10	Reserved

Identifier to CAN-open

Identifier	Message type
0	System control word
128	Synchronization message
129 ... 255	Emergencies
256	Time stamp
384 + CAN address (180h)	(TX-PDO1)
512 + CAN address (200h)	(RX-PDO1)
640 + CAN address (280h)	(TX-PDO2)
768 + CAN address (300h)	(RX-PDO2)
896 + CAN address (380h)	(TX-PDO3)
1024 + CAN address (400h)	(RX-PDO3)
1152 + CAN address (480h)	(TX-PDO4)
1280 + CAN address (500h)	(RX-PDO4)
1408 + CAN address (580h)	(TX-SDO)
1536 + CAN address (600h)	(RX-SDO)
1792 + CAN address (700h)	(NMT error control)

Notes

- Operate the CANopen module and inverter to prevent conflicts at various CAN lines of the MOVI-PLC®.
- For engineering over one of the two CAN interfaces, the CAN identifiers "Parameter Request Telegram Channel 1" and "Parameter Response Telegram Channel 1" (→ Section "Identifier in MOVILINK® protocol") from the Engineering Tool are used.

  MOVI-PLC® communication with the inverters via the same CAN line does not cause a conflict as engineering occurs via parameter channel 1. However, communication with the inverters occurs via parameter channel 2 If CANopen modules are operated on the same line, their CAN addresses must be set such that no conflicts arise.

  Example of a conflict:

  MOVI-PLC® CAN address 0 → Engineering uses CAN identifier 515 and 516 CANopen module uses CAN-address 3 → RX-PDO 1 also uses CAN identifier 515
- If the DPRAM between the drive inverter and the MOVI-PLC® control card installed in it is activated (→ Setting control configuration), set the parameter *P885 Synchronization ID SBus1* and *P895 Synchronization ID SBus2* of this drive inverter to the identifier values that are not used by a CAN telegram on the respective CAN line of the drive inverter.

6.3 MOVIDRIVE® B system variables

System variables H0 ... H900 of the MOVIDRIVE® B is reserved for use with the MPLCMotion_MDX library. System variables H901 ... H1023 can be used.

1 Index

A

Application examples 8
Areas of application 8

C

Communication times 14
Controller inhibit 25
Creating a project 113

D

Description 7
Directory
MDX/MX_Config 29
MDX/MX_Inverter Parameters 34
MDX/MX_Main 53
MDX/MX_SingleAxis 67
MDX/MX_SingleAxisSEW 89
MDX/MX_Supplements 100
MDX_SingleAxisSensorless 84
Discrete motion - continuous motion 26

E

Error codes
General IEC 109
MPCLMotion_MDX 109
MPCLUtilites 110
Error ID 109
Establishing communication 117

F

Features 8
Function module
General behavior 22
MC_AxisStop_MDX 82
MC_AxisStop_MDX/MX 82
MC_ConnectAxis_MDX/MX 53
MC_ConnectAxisSimulation_MDX/MX 59
MC_GetDataprofile4Data_MDX 34
MC_GetInverterInfos_MDX/MX 103
MC_Home_MDX/MX 80
MC_HomeEnable_MDX/MX 95
MC_InitialConfig_MDX/MX 29
MC_MoveAbsolute_MDX/MX 69
MC_MoveAbsoluteModulo_MDX 71
MC_MoveModulo_MX 78
MC_MoveRelative_MDX/MX 74
MC_MoveRelativeModulo_MDX 76
MC_MoveTargetPosition_MDX/MX 92
MC_MoveTargetSpeed_MDX/MX 89
MC_MoveTargetSpeedSensorless_MDX 97
MC_MoveVelocity_MDX/MX 67
MC_MoveVelocitySensorless_MDX 84
MC_Power_MDX/MX 62
MC_QuickEnable_MDX/MX 64
MC_ReadActualPosition_MDX 105
MC_ReadAxisError_MDX 106
MC_ReadParameter_MDX/MX 36
MC_ReadStatus_MDX 107
MC_Reset_MDX/MX 66
MC_SetDynamics_MDX/MX 40
MC_SetEncoderType_MDX/MX 42
MC_SetHomeParameters_MDX/MX 49
MC_SetJerk_MDX/MX 44
MC_SetLimiter_MDX/MX 46
MC_SetModuloParameters_MDX/MX 51
MC_SetSync_MDX/MX 32
MC_StopSensorless_MDX 86
MC_TouchProbe.._MDX/MX 100
MC_WriteParameter_MDX/MX 38
Functions 7

I

Input signal
Enable 22
Execute 22
Installing the libraries 116

L

Libraries, required 9
Literature, additional 7

N

No enable 25
Notes, important 5

O

Output signal
Active 23
Busy 23
CommandAborted 23
Done 23
Error 25
Overview of additional libraries 11
Overview of the MPLCMotion_MDX library 9

P

Positioning the motor axis 120
Prerequisites
Control topology 13
Firmware version MOVI-PLC Motion library 12
MOVIAXIS 13
MOVIDRIVE B 12
PC and software 12
Programming examples 111
Prerequisites for project planning 12
Programming example
Jog mode of a motor axis without encoder 129
Positioning a motor axis 112
Speed control of a motor axis with encoder 124
Programming examples 111
Programming jog mode 130
Programming the speed control function 125

Project planning 12

S

Safe stop 25
Safety notes 6
Safety notes for bus systems 5
Setting the control configuration 114, 124, 129
Startup
MOVIAXIS 19
MOVIDRIVE B 15
State diagram 27
Switching the drive inverter on / off 119

T

Testing the program 121, 126, 131
Trace recording 122, 127, 132
Transferring the project 121

U

Units and ranges of values
MOVIAXIS 21
MOVIDRIVE B 20

W

Warning notes 6

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Germany			
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France			
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	Lyon	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 00 Fax +33 4 72 15 37 15
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Israel			
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Italy			
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Ivory Coast			
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Japan			
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Korea			
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Latvia			
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Lithuania			
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Malaysia			
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Mexico			
Assembly **Sales** **Service**	**Queretaro**	SEW-EURODRIVE MEXIKO SA DE CV SEM-981118-M93 Tequisquiapan No. 102 Parque Industrail Queretaro C.P. 76220 Queretaro, Mexico	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx

Morocco			
Sales	**Casablanca**	Afit 5, rue Emir Abdelkader MA 20300 Casablanca	Tel. +212 22618372 Fax +212 22618351 richard.miekisiak@premium.net.ma

Netherlands			
Assembly **Sales** **Service**	**Rotterdam**	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085 NL-3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 http://www.vector.nu info@vector.nu

New Zealand			
Assembly **Sales** **Service**	**Auckland**	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 http://www.sew-eurodrive.co.nz sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 10 Settlers Crescent, Ferrymead Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz

Norway			
Assembly **Sales** **Service**	**Moss**	SEW-EURODRIVE A/S Solgaard skog 71 N-1599 Moss	Tel. +47 69 241-020 Fax +47 69 241-040 http://www.sew-eurodrive.no sew@sew-eurodrive.no

Peru			
Assembly **Sales** **Service**	**Lima**	SEW DEL PERU MOTORES REDUCTORES S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe

Poland			
Assembly **Sales** **Service**	**Lodz**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 PL-92-518 Lodz	Tel. +48 42 67710-90 Fax +48 42 67710-99 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl

Portugal			
Assembly **Sales** **Service**	**Coimbra**	SEW-EURODRIVE, LDA. Apartado 15 P-3050-901 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt

Romania			
Sales **Service**	**Bucuresti**	Sialco Trading SRL str. Madrid nr.4 011785 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro

Russia			
Assembly **Sales** **Service**	**St. Petersburg**	ZAO SEW-EURODRIVE P.O. Box 36 195220 St. Petersburg Russia	Tel. +7 812 3332522 +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru

Senegal			
Sales	**Dakar**	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 849 47-70 Fax +221 849 47-71 senemeca@sentoo.sn

Serbia and Montenegro			
Sales	**Beograd**	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor SCG-11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 dipar@yubc.net

Singapore			
Assembly **Sales** **Service**	**Singapore**	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com

Slovakia			
Sales	**Bratislava**	SEW-Eurodrive SK s.r.o. Rybnicna 40 SK-83107 Bratislava	Tel. +421 2 49595201 Fax +421 2 49595200 http://www.sew.sk sew@sew-eurodrive.sk
	Zilina	SEW-Eurodrive SK s.r.o. ul. Vojtecha Spanyola 33 SK-010 01 Zilina	Tel. +421 41 700 2513 Fax +421 41 700 2514 sew@sew-eurodrive.sk
	Banská Bystrica	SEW-Eurodrive SK s.r.o. Rudlovská cesta 85 SK-97411 Banská Bystrica	Tel. +421 48 414 6564 Fax +421 48 414 6566 sew@sew-eurodrive.sk

Slovenia			
Sales **Service**	**Celje**	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 SLO - 3000 Celje	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net

South Africa			
Assembly **Sales** **Service**	**Johannesburg**	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 494-3104 http://www.sew.co.za dross@sew.co.za

South Africa			
	Capetown	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442 Cape Town	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 dswanepoel@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 2 Monaceo Place Pinetown Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 700-3451 Fax +27 31 700-3847 dtait@sew.co.za

Spain			
Assembly **Sales** **Service**	**Bilbao**	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 E-48170 Zamudio (Vizcaya)	Tel. +34 9 4431 84-70 Fax +34 9 4431 84-71 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es

Sweden			
Assembly **Sales** **Service**	**Jönköping**	SEW-EURODRIVE AB Gnejsvägen 6-8 S-55303 Jönköping Box 3100 S-55003 Jönköping	Tel. +46 36 3442-00 Fax +46 36 3442-80 http://www.sew-eurodrive.se info@sew-eurodrive.se

Switzerland			
Assembly **Sales** **Service**	**Basel**	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. +41 61 417 1717 Fax +41 61 417 1700 http://www.imhof-sew.ch info@imhof-sew.ch

Thailand			
Assembly **Sales** **Service**	**Chon Buri**	SEW-EURODRIVE (Thailand) Ltd. Bangpakong Industrial Park 2 700/456, Moo.7, Tambol Donhuaroh Muang District Chon Buri 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com

Tunisia			
Sales	**Tunis**	T. M.S. Technic Marketing Service 7, rue Ibn EI Heithem Z.I. SMMT 2014 Mégrine Erriadh	Tel. +216 1 4340-64 + 1 4320-29 Fax +216 1 4329-76 tms@tms.com.tn

Turkey			
Assembly **Sales** **Service**	**Istanbul**	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. Bagdat Cad. Koruma Cikmazi No. 3 TR-34846 Maltepe ISTANBUL	Tel. +90 216 4419163 / 164 3838014/15 Fax +90 216 3055867 sew@sew-eurodrive.com.tr

Ukraine			
Sales **Service**	**Dnepropetrovsk**	SEW-EURODRIVE Str. Rabochaja 23-B, Office 409 49008 Dnepropetrovsk	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua

USA			
Production **Assembly** **Sales** **Service**	**Greenville**	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Manuf. +1 864 439-9948 Fax Ass. +1 864 439-0566 Telex 805 550 http://www.seweurodrive.com cslyman@seweurodrive.com

USA			
Assembly **Sales** **Service**	**San Francisco**	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, California 94544-7101	Tel. +1 510 487-3560 Fax +1 510 487-6381 cshayward@seweurodrive.com
	Philadelphia/PA	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Dayton	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 440-3799 cstroy@seweurodrive.com
	Dallas	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Additional addresses for service in the USA provided on request!		

Venezuela			
Assembly **Sales** **Service**	**Valencia**	SEW-EURODRIVE Venezuela S.A. Av. Norte Sur No. 3, Galpon 84-319 Zona Industrial Municipal Norte Valencia, Estado Carabobo	Tel. +58 241 832-9804 Fax +58 241 838-6275 http://www.sew-eurodrive.com.ve sewventas@cantv.net sewfinanzas@cantv.net

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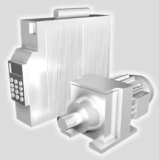

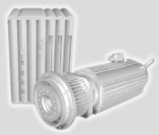

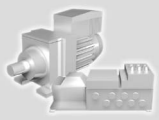

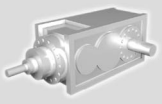

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